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THE DIRECTOR OF THE BUREAU OF THE BUDGET, 20 FEB. 1956

Monthly Message

A picture of Surgeons General Hays, USA, and Niess, USAF, and Deputy Surgeon General, Admiral Bruce Bradley, USN, together with representatives of the Standardization Committee, Dr. Cushing and me appears in this issue. During World War II there was much confusion when it became necessary to hospitalize members of one military service in an installation of another. This was due to the multiplicity and difference of administrative forms, reports and statistical procedures unique to each service.

In 1948 Secretary of Defense James V. Forrestal established a program to standardize these forms and procedures as a means of promoting unification of the military medical services and subsequently responsibility was assigned for the program to the Director of Medical Services, Office of the Secretary of Defense. This assignment has continued and today constitutes one of the more important activities of the Assistant Secretary of Defense (Health and Medical). Staff functions required for the effective operation of this program have been performed by the three directors of the military Medical Statistics Divisions. Through their efforts over 100 medical forms, a medical nomenclature and statistical classification, and numerous medical recording and reporting procedures have been standardized. In addition several forms and procedures have been standardized with NATO and other foreign countries.

The program has been most successful and today increasing unification of the military medical services in these procedures is established and well accepted. Transfer of patients among departments and joint use of medical services and facilities are common practices, biometric and other medical data are interchanged freely, and comparable statistical data are available for better management of medical services. These advances have steadily improved efficiency, economy and effectiveness of military support.

As we take cognizance of the tenth year of the operation of the program, a letter of appreciation from this office has been presented to each of the chiefs of the Medical Statistics Divisions of the three services.

Biostatistics are of value in direct proportion to their comparability. The attainments along unified lines so far accomplished have resulted in easier procedures in cross-servicing among the hospitals of the three services; *i. e.*, admissions of patients of one service to hospitals of other services. The program is continuing, with one of the major goals a revision of the nomenclature and statistical abstract, with early completion expected.

Frank B. Berry

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Assistant Secretary of Defense
(Health and Medical)

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Foreword

The *United States Armed Forces Medical Journal* is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense. The Assistant Secretary of Defense (Health and Medical) and the Surgeons General of the several services invite all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, and officers of the Veterinary Corps of the Armed Forces, and the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this *Journal.*

FRANK B. BERRY, M. D.,
Assistant Secretary of Defense (Health and Medical).

MAJOR GENERAL SILAS B. HAYS,
Surgeon General, United States Army.

REAR ADMIRAL BARTHOLOMEW W. HOGAN,
Surgeon General, United States Navy.

MAJOR GENERAL OLIVER K. NIESS,
Surgeon General, United States Air Force.

UNITED STATES ARMED FORCES
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THE TREATMENT OF CARDIAC ARREST FOLLOWING MYOCARDIAL INFARCTION

JOHN G. McGREGOR, *Captain, MC, USA*
DWIGHT E. NEWTON, *Captain, USAF (MC)*

THE high incidence of death from cardiac arrest secondary to myocardial infarction has made the study of this entity of interest and concern to physicians who care for cardiac patients. The majority of sudden deaths following myocardial infarction are due to ventricular arrhythmias, predominantly ventricular fibrillation. Garrey[1] and Wiggers[2] were among the first investigators to show that ventricular fibrillation could be abrogated and reverted to normal rhythm by the application of cooling agents to the heart, by the administration of solutions containing potassium, and by electric countershock. These investigations were rapidly followed by the clinical application of resuscitative technics to patients who sustained cardiac arrest while undergoing surgical procedures. Johnson, Kirby, and Dripps,[3,4] Stephenson, Reid, and Hinton,[5] and many others pioneered this work, developing technics and achieving a remarkable degree of success.

The clinical application of resuscitative technics has been confined primarily to surgical patients, and has been restricted to those accidents which occurred in the operating room. There has been little enthusiasm for the application of these new technics to medical patients in whom myocardial infarction was the cause of the ventricular fibrillation. The work on dogs by Wiggers[6,7] in 1936 and again in 1940 indicated that defibrillation was difficult to achieve when the coronary arteries were permanently occluded. Some unpublished work by Papper[8] also seemed to indicate a very questionable medical applicability for the procedure.

From Brooke Army Hospital, Fort Sam Houston, Tex. Capt. McGregor is now assigned to Army Medical Service School, Fort Sam Houston, Tex.

During the last two years, three cases of successful cardiac resuscitation were reported in patients who had cardiac arrest resulting from myocardial infarction.[9-11] In each of these cases an antecedent myocardial infarction probably had occurred and the technics of emergency thoracotomy, cardiac massage, artificial respiration, and defibrillation by electric countershock were employed successfully. Unfortunately, the reports of failure in similar cases cannot be found in the literature. Until the successful instances are compared with the failures, no accurate appraisal of the true worth of this procedure to the medical patient can be made. It is the purpose of this report to record the experiences of the medical staff of this hospital with patients who developed cardiac arrest following myocardial infarction, and who received emergency thoracotomy, cardiac massage, and attempted defibrillation. The fourth successful resuscitation of such a patient also is reported.

REVIEW OF THE LITERATURE

Ventricular fibrillation may be defined as an in-co-ordinate type of contraction wherein no useful work is performed by the ventricular musculature despite a very high metabolic rate. As a result of such ventricular activity, arterial pressure rapidly falls; coronary perfusion ceases, as does the flow of oxygenated blood to the vital centers of the central nervous system; and death occurs within six to eight minutes as a result of anoxia of the brain and spinal cord.

The cause of ventricular fibrillation is uncertain, despite a large amount of research. Myocardial hypoxia appears to be a predisposing factor and probably exists as the common denominator in all cases. More than simple anoxia or hypoxia, however, is required to produce ventricular fibrillation. Some type of stimulus seems to be necessary. Wiggers[12] and Mines[13] showed that an electric stimulus applied to the myocardium during the inscription of the electrocardiographic T wave (during the last 0.06 seconds of electric systole) would precipitate ventricular fibrillation. The amount of current required to induce the fibrillation could be altered by the degree of hypoxia of the myocardium. The matter rested in the medical literature at this point until Beck and Leighninger[14] proposed the principle of "self-electrocution."

Beck and Leighninger began by demonstrating that the totally anoxic myocardium was relatively resistant to spontaneous fibrillation. They then showed that two adjacent, but differentially oxygenated, areas of myocardium had measurably different electrical potentials. They proposed that this difference in potential acting across the transition zone could serve as the electric "trigger" to induce fibrillation. This situation is thought to occur in hearts which have sustained myocardial infarction secondary to coronary occlusion.

Whatever the cause, once ventricular fibrillation begins, it is a continuously evolving series of events which Wiggers[15] studied

by slow-motion cinematography. It was shown that fibrillation begins as an aberrant premature ventricular contraction. Wave fronts from this contraction spread unevenly over the myocardium, causing the formation of several large areas of independently contracting muscle. At this stage the heart appears to be convulsing. Each of these large areas becomes subdivided into smaller and smaller units until the myocardium consists of a multitude of minute areas of contracting muscle producing the "bag of worms" stage of fibrillation. No co-ordinated or effective beat can be produced and cellular anoxia rapidly occurs as a result of the high metabolic rate of such activity and the failure of coronary perfusion. Unless this cycle is interrupted and coronary blood flow re-established, the co-ordinated beat of the myocardium cannot be re-established.

Successful resuscitation depends on the prompt recognition that cardiac arrest has occurred and the rapid introduction of treatment. The diagnosis should be based on the abrupt onset of coma, cyanosis, absence of heart sounds, inability to obtain blood pressure, or peripheral pulses, and apnea. The absence of arterial pulses is best determined by palpation of the femoral or carotid arteries. This and the absence of heart sounds are the best signs of cardiac arrest. Other signs are unreliable and the search for them causes an unwarranted loss of time. Electrocardiographic confirmation of ventricular fibrillation is unnecessary. Generally speaking, emergency thoracotomy is indicated if arterial pulsations cannot be felt. If the patient is in a hospital and a device for external defibrillation is present, this should be given a trial before thoracotomy and cardiac massage. Defibrillators are increasingly available in hospitals and, in the instances in which the patient is in a critical condition very little time is lost in trying it if the instruments can be kept close by.

Once the diagnosis of cardiac arrest is established, the physician enters into a race with time. The most pressing problem is to deliver oxygenated blood to the central nervous system and the fibrillating myocardium. Stephenson, Reid, and Hinton[5] and Cole and Corday[16] agreed that cardiac massage must be begun within four minutes if successful resuscitation is anticipated. This is to say that the diagnosis must be established, thoracotomy performed, artificial respiration begun, and cardiac compression instituted within four minutes. Permanent cardiac and central nervous system damage usually will result if this time is exceeded. Once cardiac massage has been instituted and cardiac output has been temporarily restored, attention can be directed to the conversion of the fibrillation to a normal rhythm by electric countershock.

Thoracotomy and cardiac compression can be carried out by any physician and does not require the presence of a surgeon. Successful resuscitation does, however, require the presence of a second person capable of establishing and maintaining an airway and administering oxygen and artificial respiration. Cardi-

ac resuscitation should not be attempted without the presence of this second person.

The technic of thoracotomy is relatively simple. An incision is made in the left fourth or fifth anterior intercostal space from the left sternal border to the anterior axillary line. No attempt to obtain sterile conditions is made. As the pleura is entered, the left lung collapses and the right hand can easily be inserted into the chest. The heart is grasped so that the thumb is anterior and the four fingers are posterior. Compression is instituted through the intact pericardium either by squeezing the heart or by compressing it against the sternum. It is helpful to wedge the left fist vertically between the ribs, or to cut the costal cartilage of the superior rib to keep pressure off the right wrist.

In order to be most effective, cardiac massage should produce a palpable carotid pulsation. The rate of compression should be about 60 to 85 beats per minute. Compression of the heart should be accomplished with the flat of the fingers through the intact pericardium to avoid perforation of the myocardium. It usually is not necessary to compress the descending aorta to obtain adequate cerebral and coronary blood flow.

The flow of oxygen to the lung must be established simultaneously with the onset of cardiac massage. Insufflation of oxygen through a tight-fitting face mask, by means of an intermittent positive pressure breathing apparatus manually operated, is a useful method which will suffice until an anesthesiologist and his equipment arrive. When no special equipment is available, mouth-to-mouth respiration can be used effectively. It is advisable to compress the abdomen occasionally to prevent overdistention of the stomach when such methods are used.

Once cardiac compression and the insufflation of the lungs are established, the dire emergency subsides. Now the heart must be defibrillated. Experience dictates that it is best to await the surgical-anesthetist team before attempting defibrillation. The method of choice is electric countershock. The pericardium is opened, and countershock of at least 130 volts for 0.1 seconds is delivered to the myocardium by flat 5-cm electrodes applied anteriorly and posteriorly. A standard type of defibrillator is essential. The shock is usually followed by ventricular standstill. It may be necessary to continue cardiac massage until the ventricle maintains a rhythmic beat. Repeated shocks may be employed if ventricular standstill is not obtained. If repeated shocks are not successful, procaine amide hydrochloride, calcium chloride, epinephrine, sodium lactate, or potassium chloride should be given into the left ventricle. The exact sequence of drugs depends upon the operator.

The question of when to terminate cardiac massage, if all measures fail, is still a problem. The presence of persistent atony of the myocardium, diminished electric activity by electro-

cardiography, and fixation of the pupils are sufficient reason to discontinue further resuscitative efforts.

If cardiac resuscitation has been successful and the patient maintains a sinus rhythm and adequate blood pressure, the chest may be closed by the surgeons. It has been found advisable to perform the closure on the ward, using local anesthesia, rather than transport the patient to the operating room. Care after resuscitation usually is given by cardiologists and consists primarily of the routine treatment of a patient with myocardial infarction. The chest wound is managed in the usual manner by members of the surgical service. Antibiotics should be given routinely, although this type of unsterile procedure usually is not followed by infection.

CASE REPORTS

Case 1. A 51-year-old automobile mechanic was admitted to this hospital on 18 July 1957, complaining of crushing substernal chest pain of one hour's duration. The patient had a nine-month prior history of angina pectoris, relieved by nitroglycerin. He had had no symptoms of congestive failure and no prior history of heart disease. When seen in the emergency room, he was found to have a blood pressure of 200/90 mm Hg and a pulse rate of 102 per minute. He was then admitted to the cardiology service where he was noted to have a blood pressure of 140/90 mm Hg and a pulse rate of 124 per minute with bigeminy. The remainder of the physical examination revealed no pertinent abnormalities and the patient appeared free of pain, was perfectly lucid and rational.

About one half hour after admission the patient again began to complain of crushing substernal chest pain and to appear apprehensive. He was given morphine sulfate intravenously and an electrocardiographic tracing was begun. The standard and augmented limb leads showed no diagnostic pattern. As lead V_1 was being taken, the pattern of ventricular fibrillation appeared (fig. 1). One minute later the left chest was entered through the fifth anterior intercostal space with no effort to maintain sterile technic. The heart was found to be fibrillating palpably and had good tone. Massage was started at a rate of approximately 80 contractions per minute, and oxygen was delivered to the lung by means of a Bennett intermittent positive pressure breathing apparatus using a face mask and operating the breathing cycle manually. The cardiac massage was vigorous enough to produce a faint carotid pulse. The lungs were noted to be visibly inflated and the patient's color remained fair.

A surgical-anesthetist team arrived 25 minutes after the onset of fibrillation. An endotracheal tube was inserted and positive pressure insufflation of the lung with 100 per cent oxygen was instituted. The pericardium was opened and a defibrillating shock of 130 volts for 0.1 second was delivered through electrodes placed on the anterior and posterior surfaces of the myocardium. The heart went into complete standstill for a brief instant and then slowly resumed a rhythmic beat, about 30 minutes after the onset of fibrillation. The electrocardiogram

at this time showed a sinus rhythm with frequent premature ventricular contractions which gradually became less frequent as the ventricular rate approached 80 beats per minute. The blood pressure gradually rose to 140/90 mm Hg and the patient began to regain consciousness and move about. The chest wall was infiltrated with 2 per cent lidocaine hydrochloride solution and repair of the chest wound was begun. As a chest tube was being inserted through a stab wound in

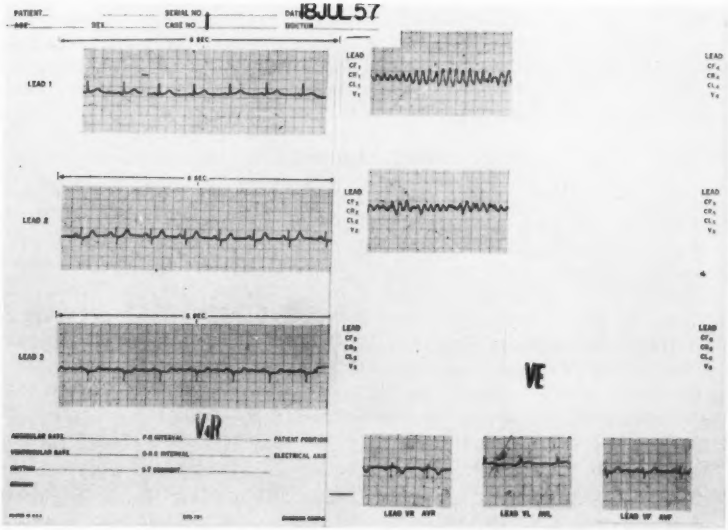


Figure 1 (case 1). Admission electrocardiogram showing an abnormal tracing with the pattern of ventricular fibrillation appearing in precordial leads.

the chest wall, the heart again began to fibrillate. Massage was resumed immediately and another defibrillatory shock was applied. Complete standstill occurred followed by slow resumption of normal beat and rate. The electrocardiogram indicated that ventricular premature contractions were more frequent, and 500 mgm of procaine amide hydrochloride (Pronestyl Hydrochloride) was given intravenously with prompt disappearance of the premature contractions. Repair of the chest wall was then completed without further complications. By this time the patient was conscious and aware of what had happened.

During the postresuscitative period the patient was given massive prophylactic antibiotic therapy and intravenous procaine amide hydrochloride, 250 mgm every 6 hours. The patient's convalescence was essentially uncomplicated. The pulse and blood pressure remained stable. On the fourth day after resucitation the patient was placed on anticoagulants, and these were continued until the thirty-seventh day. The chest wound healed without incident and subsequent roentgenograms of the chest showed clear lung fields. Electrocardiograms taken

in the postresuscitative period showed the typical pattern of acute anteroseptal myocardial infarction (figs. 2 and 3) and subsequently demonstrated the expected resolution changes of this process. The patient was hospitalized for a total of 45 days and has been followed since discharge on an outpatient basis in the cardiology clinic. Six months after discharge from the hospital he complained of mild exertional dyspnea and intermittent angina pectoris but demonstrated no signs of congestive failure. He has returned to work on a half-day basis. Neuropsychiatric evaluation revealed no evidence of neurologic deficit or brain damage. Examination of this patient 18 months after his resuscitation reveals his general health to be good. He suffers from mild angina, but continues his occupation as automobile mechanic.

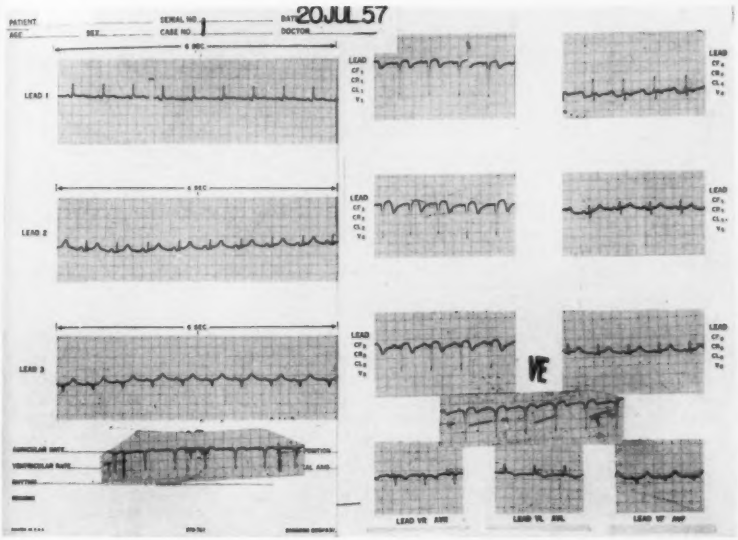


Figure 2 (case 1). Tracing taken on the second day after resuscitation, showing an abnormal tracing with the early resolution changes of an anteroseptal myocardial infarction.

Comment. This case is the fourth reported instance of successful resuscitation of a patient who sustained ventricular fibrillation secondary to myocardial infarction. There was a fortunate coincidence, in this instance, in that the electrocardiogram was being taken at the moment of ventricular fibrillation. The rapid entry into the chest (fig. 4) and the cardiac massage were performed by an internist untrained in thoracic surgery and the patient was effectively maintained by the internist until the arrival of the surgeon and anesthetist with their special equipment some thirty minutes later.

It is of interest that the only drug used in this case was procaine amide hydrochloride. It was not used in the actual resuscitation, but in specifically preventing the premature beats

following defibrillation. The use of drugs, while sometimes helpful, does not serve as a substitute for the positive resuscitative measures of thoracotomy and cardiac massage followed by electric defibrillation.

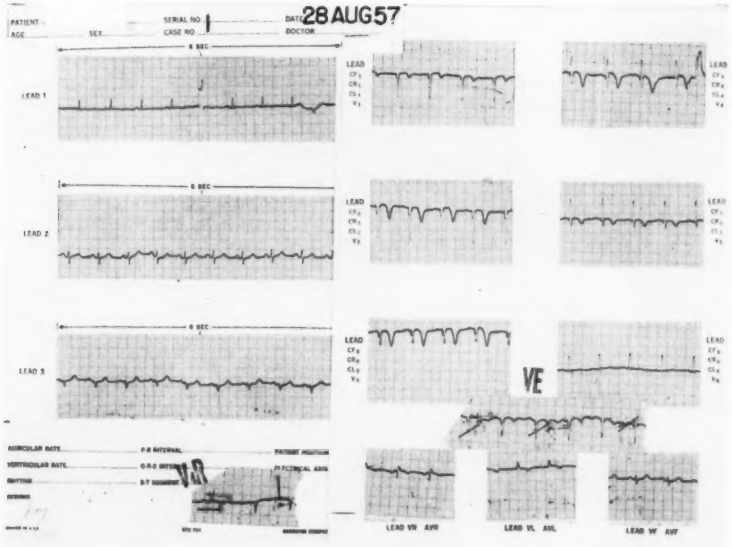


Figure 3 (case 1). The electrocardiogram on the fortieth postresuscitative day, showing an abnormal tracing with late resolution changes of an anteroseptal myocardial infarction. Compared with previous tracings there are isoelectric S-T segments and more deeply inverted T waves from V_1 through V_5.

Case 2. A 39-year-old Air Force pilot was admitted to this hospital on 31 January 1957, because of gastrointestinal hemorrhage. Physical examination and diagnostic studies failed to reveal a bleeding site, although moderately severe esophagitis was noted on esophagoscopy. The patient was treated symptomatically and replacement transfusions were given to correct an initially low hemoglobin. His convalescence from the gastrointestinal hemorrhage was uneventful.

Three weeks following admission the patient was lying quietly in bed when he suddenly rolled from his bed to the floor. His body became rigid, cyanosis appeared about the face and neck, and no respiratory effort could be seen. About a minute later a physician arrived and found the patient completely flaccid, gasping occasionally, but without palpable pulse or audible heart tones. Positive pressure oxygen was administered by mask and artificial respiration was carried out by compression of the thoracic cage. The surgical officer of the day was sought and arrived some six minutes after fibrillation had begun.

An emergency thoracotomy was performed and the heart was noted to be in complete standstill. Cardiac massage was instituted about

nine minutes after collapse of the patient. About two minutes later an anesthetist arrived and inserted an endotracheal tube and positive pressure insufflation of the lungs commenced. The heart was flabby at the beginning of massage and after a few minutes of massage the tone improved and ventricular fibrillation was noted. During the 90 minutes following arrest, continuous cardiac massage and pulmonary insufflation were carried out and six repeated attempts at electric defibrillation, using gradually increasing voltage up to a maximum of 180 volts for 0.1 second, were without success. Intravenous infusion of Norepinephrine was begun without visible effect. Calcium

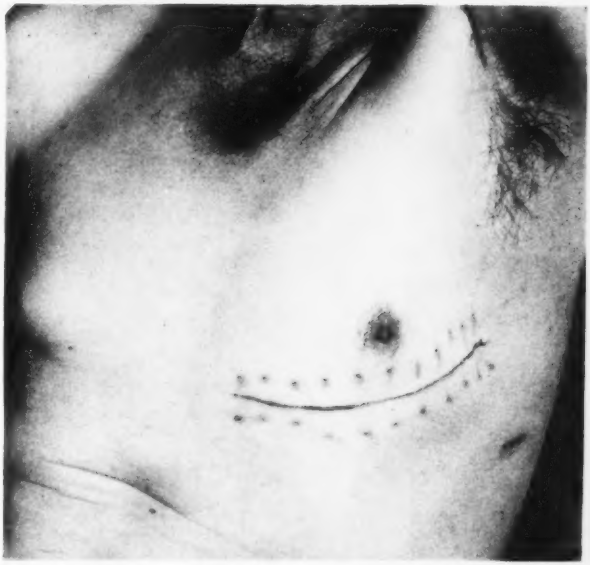
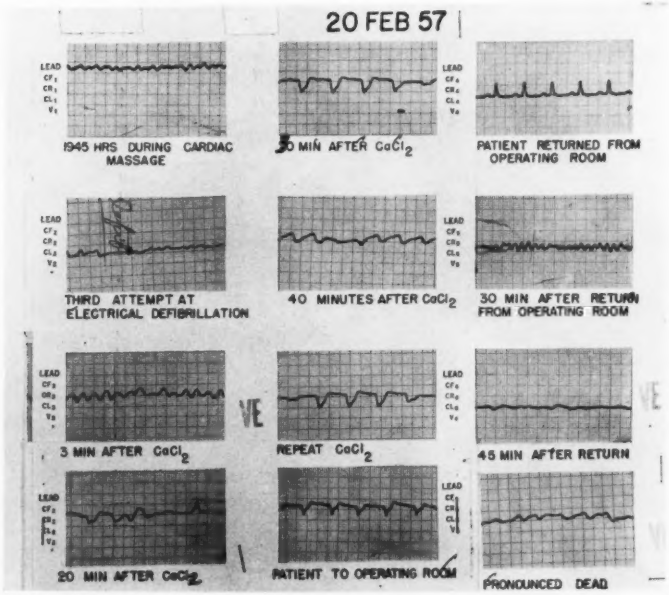


Figure 4 (case 1). Photograph of patient showing the type of incision used and its placement on the chest.

chloride was injected several times into the left ventricle, and after about two hours of massage the ventricles began to develop a rhythmic beat. The electrocardiogram (fig. 5) showed an abnormal ventricular complex with ventricular rate between 80 and 90 beats per minute. This gradually changed to a sinus rhythm. The systolic blood pressure rose to 100 mm Hg and the patient began to blink his eyes and show signs of awakening. The chest wound was approximated with towel clips and the patient transported to the operating room for closure of the wound. The closure was carried out without untoward incident, using intravenous thiopental sodium anesthesia, and the patient maintained a sinus rhythm throughout this procedure. Shortly after completion of the closure of the chest wound, the patient's respiratory rate suddenly slowed and became irregular, and a tracheotomy was performed. The patient abruptly went into respiratory arrest and positive pressure pulmonary insufflation was again begun and carried out

for the next hour. The patient subsequently made no attempt to resume spontaneous respiration and the right pupil progressively dilated. Cardiac function persisted unchanged at first, then progressive arrhythmia appeared, and finally ventricular fibrillation was noted. Resuscitative efforts were discontinued.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1945 HRS DURING CARDIAC MASSAGE
30 MIN AFTER CaCl2
PATIENT RETURNED FROM OPERATING ROOM
THIRD ATTEMPT AT ELECTRICAL DEFIBRILLATION
40 MINUTES AFTER CaCl2
30 MIN AFTER RETURN FROM OPERATING ROOM
3 MIN AFTER CaCl2
REPEAT CaCl2
45 MIN AFTER RETURN
20 MIN AFTER CaCl2
PATIENT TO OPERATING ROOM
PRONOUNCED DEAD

Figure 5 (case 2). Representing segments of standard lead II taken at indicated intervals throughout the patient's course in the hospital. Tracings read from top downward in the column.

Autopsy revealed mild coronary arteriosclerosis with an acute occlusion of the circumflex branch of the right coronary artery and an old occlusion of the left anterior descending branch. The pericardium revealed fibrinous pericarditis, secondary to the cardiac massage.

Comment. In appraising the clinical course of this patient it is obvious that far too great an interval elapsed between the patient's collapse and the beginning of cardiac massage. This time lapse caused irreversible central nervous system damage and probably his ultimate death. The reluctance of the attending physician to attempt thoracotomy and cardiac massage, the search for the surgeon, and the attempt at artificial respiration consumed almost ten valuable minutes. Even so, the heart was successfully defibrillated, only to have the patient die as a result of apparent central nervous system failure.

The conclusion must be drawn from this case that it is the responsibility of the attending physician to establish the diagnosis and to perform the thoracotomy and cardiac massage when

a patient develops cardiac arrest. Time is entirely too precious to waste on artificial respiration, injection of drugs, or frantic searching for a surgeon.

The use of calcium chloride which, in this case, seemed to produce a rhythmic ventricular contraction after six attempts at electric defibrillation failed, indicates that chemical agents are sometimes effective and should not be forgotten. The use of sodium lactate by Bellet, Wasserman, and Brody[17] in ventricular arrhythmias, and Wiggers'[12] use of potassium and calcium salts provide additional experimental support for clinical use. It should be emphasized that in most cases the use of drugs supplements electric countershock, but does not supplant it.

The use of general anesthesia while closing the chest probably was unwise and added to the central nervous system damage. Adequate wound closure can be performed using local anesthesia on the medical ward where cardiac arrest has occurred.

Case 3. A 46-year-old construction worker was admitted to this hospital on 23 June 1957, with the complaint of crushing substernal chest pain of three hours' duration. Nine months prior to this admission the patient was hospitalized for a posterior myocardial infarction from which he had an uneventful convalescence. He had been maintained on an outpatient regimen of restricted activity, sedatives, and a low-fat, low-salt diet. Physical examination on admission revealed a blood pressure of 140/70 mm Hg and a pulse rate of 100 beats per minute. There was no evidence of cardiac decompensation.

The patient was given meperidine hydrochloride intravenously, and an electrocardiogram was begun. The standard and augmented limb leads showed evidence of an old posterior myocardial infarction and, as lead V_2 was being taken, the tracing abruptly changed to the pattern of ventricular fibrillation. The patient became comatose, the blood pressure and cardiac sounds were unobtainable. Quinidine was given intravenously and the chest was pounded vigorously. An emergency thoracotomy was performed four to five minutes after the onset of fibrillation, and cardiac massage was begun. The heart was flabby and fibrillating palpably. One and one-half minutes after the onset of massage, an endotracheal tube was inserted and positive pressure insufflation of the lungs begun. Following this, repeated intracardiac injections of procaine amide hydrochloride and calcium chloride did not alter the fibrillation. After one and one-half hours of massage a regular idioventricular rhythm developed and was maintained for approximately ten minutes. There was no attempt at spontaneous respiration during this period and ventricular fibrillation again recurred. Attempt at electric defibrillation two hours after arrest was unsuccessful and an electrocardiogram revealed progressive decrease in the electric activity. Cardiac massage was discontinued three hours after arrest.

Autopsy revealed acute passive congestion and hemorrhage of the myocardium as a result of cardiac massage, an area of myocardial

fibrosis in the posterior aspect of the left ventricle near the apex, and a marked generalized atherosclerotic narrowing of the lumen of the coronary arteries. No indication of acute myocardial infarction or total occlusion of any artery was found.

Comment. This case illustrates the premise that no time should be wasted by injecting drugs into either peripheral veins or the left ventricle because drugs are undependable in altering ventricular fibrillation. It is doubtful if drugs injected in this manner ever reach the coronary bed when the ventricle is fibrillating. A minimum of time should be allowed to elapse between cardiac arrest and resuscitation. Even the use of external electric defibrillation as advocated by Zoll[18] is questioned on the grounds that the equipment is not ordinarily available and if the attempt is unsuccessful much valuable time has been lost. The patient with cardiac arrest must have oxygenated blood delivered to the central nervous system and myocardium within four minutes following the arrest. The only predictable method of obtaining this goal is the manual emptying of the exposed heart.

Case 4. A 53-year-old housewife was admitted to this hospital on 2 February 1957 because of congestive heart failure of two weeks' duration. The patient had a 20-year past history of diabetes mellitus with good control. Physical examination revealed a blood pressure of 120/80 mm Hg and a pulse rate of 104 per minute. There was marked diabetic retinopathy, prominent distention of neck veins, and bilateral basilar pulmonary rales. The liver was palpable 8 cm below the right costal margin, and severe pitting edema was present from knees to ankles. An electrocardiogram revealed an old anteroseptal myocardial infarction.

The patient was digitalized orally and placed on mercurial diuretics; a low-salt, diabetic diet; and insulin coverage at appropriate dosage. On the fifth hospital day the patient was essentially clear of her chronic congestive heart failure and was sitting in a wheel chair at her bedside when she suddenly became comatose and was immediately placed back in bed. The patient had absent peripheral pulses and no cardiac sounds could be heard. Approximately five minutes later an electrocardiogram showed ventricular fibrillation. Emergency thoracotomy was performed by the ward physician approximately eight minutes after her collapse. The heart was found to be flabby and in standstill. Cardiac massage was begun, but artificial respiration was not effectively carried out. The surgical-anesthetist team arrived within the next few minutes and an endotracheal tube was inserted and positive pressure insufflation of the lungs begun. Forty-five minutes after arrest attempted electric defibrillation produced cardiac standstill followed by return of the sinus rhythm with abnormally wide QRS complex. A brief run of normal sinus rhythm was maintained following which ventricular fibrillation returned and over a period of the next hour increasing amounts of electric countershock were ineffective in obtaining defibrillation. Electric activity of the heart progressively decreased and cardiac massage was discontinued two hours after arrest.

Autopsy revealed an old extensive anteroseptal myocardial infarction with a fresh thrombus occluding the right coronary artery.

Comment. This case illustrates the utter futility of attempting to confirm the diagnosis of cardiac arrest by electrocardiogram. The manner in which the patient collapsed and the physical findings were sufficient in themselves to establish the diagnosis and dictate emergency thoracotomy. Approximately eight minutes elapsed between collapse and the onset of cardiac massage. On entry into the chest, the heart was flabby which, we have come to realize, is an extremely grave prognostic sign. The heart was rather easily defibrillated but the myocardial anoxia was so prolonged that rhythmic beat could not be maintained by the damaged muscle and conduction system.

Case 5. A 71-year-old man was admitted to this hospital with a one hour history of crushing substernal pain. The patient was said to have had a five-year past history of angina pectoris relieved by nitroglycerin. On admission to the medical ward, the physical examination revealed no palpable peripheral pulse, no obtainable blood pressure, no audible heart tones. There was marked cyanosis of the face, neck, and upper thorax. An electrocardiogram showed rapid ventricular fibrillation. Oxygen was administered by face mask with an intermittent positive pressure breathing apparatus and the left side of the chest was entered 12 minutes after the patient collapsed. Cardiac massage was carried out until the arrival of the surgical-anesthestist team at which time the pericardium was opened and several attempts at electric defibrillation were without success. Calcium chloride and epinephrine given intracardially were also without effect. Because of the progressively increasing subepicardial hemorrhage and decreasing electric activity of the heart, resuscitative efforts were discontinued two and one-half hours after cardiac arrest had occurred.

Autopsy showed extensive subepicardial hemorrhage involving the apex and the anterior ventricular wall. There was generalized severe arteriosclerotic narrowing of the coronary arteries with an acute occlusion of the anterior descending coronary artery 1 cm from the coronary orifice.

Comment. This patient had sustained cardiac arrest at some time prior to his arrival on the cardiology service, and attempt at resuscitation was a desperation measure. The myocardial damage and anoxia were so severe that defibrillation was not successful. The justification for attempting cardiac resuscitation was that the time of onset of cardiac arrest was unknown. The confirmation of the diagnosis by electrocardiogram was unnecessary and prolonged the time between arrest and treatment.

SUMMARY AND CONCLUSIONS

The high incidence of deaths from cardiac arrest secondary to myocardial infarction has made this entity of prime concern to all physicians. The majority of deaths are due to ventricular arrhythmias, predominantly ventricular fibrillation. The mecha-

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nism of ventricular fibrillation, although not thoroughly understood, may be related to differential hypoxia of the myocardium. In cardiac resuscitation it is imperative that cardiac compression and pulmonary insufflation be instituted within four minutes after arrest.

In five patients with cardiac arrest secondary to myocardial infarction at an Army hospital resuscitation was attempted. Two of the patients were resuscitated successfully and one is alive and doing well except for moderate angina pectoris. The other patient died one hour after resuscitation from central nervous system damage, probably the result of unnecessary delay before cardiac resuscitation was instituted.

The measures necessary for resuscitation of patients who have sustained ventricular fibrillation are not applicable to all patients or to all situations. There are medicolegal aspects which have not yet been clearly defined. Our experience indicates the following criteria to be useful guides in selecting patients for this procedure. Keen professional judgment is paramount in applying them to the individual patient.

1. To be amenable to emergency resuscitation procedures, the catastrophe of ventricular fibrillation must occur to the patient in a hospital environment. It seems unreasonable to attempt such extreme measures in the street or in the home.

2. The physical findings indicating cardiac arrest (apnea, absent arterial pulsations, cyanosis, coma, and convulsions) should occur in an appropriate clinical context. That is to say, there should be an antecedent myocardial infarction, cardiac arrhythmia, electrocution accident, or other similar clinical setting wherein cardiac arrest is known to be a complication.

3. The time of onset of the cardiac arrest must be known with approximate accuracy. The time interval from cardiac arrest to successful resuscitation is believed to be less than four minutes. It, therefore, would seem futile to attempt resuscitation on patients who have had ventricular fibrillation for a greater length of time. It is probably best to err on the side of attempting the resuscitation should the time interval appear questionable.

4. At least two persons must be available to perform the resuscitative procedure. One person probably should be a physician and should perform the thoracotomy and cardiac compression. The second person must be able to establish a patent airway and administer artificial respiration.

5. A surgical-anesthetist team should be available within one hour. Cardiac compression itself produces myocardial damage, and when continued for more than one hour usually precludes defibrillation. The hypoxia of the central nervous system and the myocardium are only partially corrected by cardiac compression and artificial respiration and the amount of damage to both structures becomes excessive after this time.

6. The prior clinical condition of the patient must be evaluated. The presence of multiple previous myocardial infarctions, the presence of severe systemic disease, and the age of the patient must all be considered in the decision to attempt cardiac resuscitation.

Our experience, coupled with that of others,[9-11] indicates that some patients who have sustained cardiac arrest secondary to myocardial infarction can be successfully resuscitated. Physicians must be made more aware of the entity of ventricular fibrillation and the possibilities of therapy. Resuscitative measures are heroic; however, the salvage rate is great enough to justify the effort if even an occasional patient is saved.

ADDENDUM: Since preparation of this manuscript an additional case of resuscitation following myocardial infarction has been reported. Bloomfield and Mannick[19] have provided documentary evidence from the Massachusetts General Hospital of a myocardial infarction causing ventricular fibrillation. They were able to obtain complete resuscitation by means of emergency thoracotomy and cardiac massage.

REFERENCES

1. Garrey, W. E.: Auricular fibrillation. *Physiological Rev.* 4: 215-250, Apr. 1924.
2. Wiggers, C. J.: Studies of ventricular fibrillation caused by electric shock; revival of heart from ventricular fibrillation by successive use of potassium and calcium salts. *Am. J. Physiol.* 92: 223-239, Feb. 1930.
3. Johnson, J.; Kirby, C. K.; and Dripps, R. D.: Defibrillation of ventricles by electric shock with complete recovery. *Ann. Surg.* 134: 116-118, July 1951.
4. Johnson, J., and Kirby, C. K.: Surgical treatment of ventricular fibrillation. *Ann. Surg.* 134: 672-682, Oct. 1951.
5. Stephenson, H. E., Jr.; Reid, L. C.; and Hinton, J. W.: Pitfalls, precautions, and complications in cardiac resuscitation; study of 1200 cases. *A. M. A. Arch. Surg.* 69: 37-53, July 1954.
6. Wiggers, C. J.: Cardiac massage followed by countershock in revival of mammalian ventricles from fibrillation due to coronary occlusion. (Proceedings of American Physiological Society) *Am. J. Physiol.* 116: 161-162, 1936.
7. Wiggers, C. J.: Physiologic basis for cardiac resuscitation from ventricular fibrillation—method for serial defibrillation. *Am. Heart J.* 20: 413-422, Oct. 1940.
8. Papper: Cited in reference 10.
9. Reagan, L. B.; Young, K. R.; and Nicholson, J. W.: Ventricular defibrillation in patient with probable acute coronary occlusion. *Surgery* 39: 482-486, Mar. 1956.
10. Celio, A.: Cardiac arrest associated with coronary occlusion: successful resuscitation. *J. Internat. Coll. Surgeons* 25: 299-305, Mar. 1956.
11. Beck, C. S.; Weckesser, E. C.; and Barry, F. M.: Fatal heart attack and successful defibrillation; new concepts in coronary artery disease. *J. A. M. A.* 161: 434-436, June 2, 1956.
12. Wiggers, C. J.: Muscular reactions of mammalian ventricles to artificial surface stimuli. *Am. J. Physiol.* 73: 346-378, July 1925.
13. Mines, G. R.: On circulatory excitations in heart muscles and their possible relation to tachycardia and fibrillation. *Trans. Roy. Soc. Canada.* Series 3, 8: 42, 1924.
14. Beck, C. S., and Leighninger, D. S.: Operations for coronary artery disease, In American Medical Association: A. M. A. Scientific Exhibits, 1955 [Sponsored by Council on Scientific Assembly]. Grune & Stratton, Inc., New York, N. Y., 1955.
15. Wiggers, C. J.: Mechanism and nature of ventricular fibrillation. *Am. Heart J.* 20: 399-412, Oct. 1940.
16. Cole, S. L., and Corday, E.: Four-minute limit for cardiac resuscitation. *J. A. M. A.* 161: 1454-1458, Aug. 11, 1956.

17. Bellet, S.; Wasserman, F.; and Brody, J. I.: Treatment of cardiac arrest and slow ventricular rates in complete A-V heart block; use of molar and half molar sodium lactate; clinical study. *Circulation* 11: 685-701, May 1955.

18. Zoll, P. M.: Resuscitation of heart in ventricular standstill by external electric stimulation. *New England J. Med.* 247: 768-771, Nov. 13, 1952.

19. Bloomfield, D. K., and Mannick, J. A.; Successful resuscitation in acute myocardial infarction with ventricular fibrillation; report of case. *New England J. Med.* 258: 1244-1247, 19, June 1958.

EYES, HANDS AND EARS

For many years physicians depended on their eyes and ears to unravel the mysteries of the body. Through necessity some physicians with a keen sense of curiosity learned to examine the surface of the chest and to make rather remarkable deductions about the status of the heart and lungs. The teachings of these physicians have been handed down, though modified, ever since. During the last two decades new and wonderful recording equipment has revived the interest in careful physical examination, since scrutiny of the records has shown that there is more to be found than was suspected. We must become curious again—this time, influenced by the records obtained from the recording equipment—and try to extract all the information possible from simple bedside examinations, using our eyes, hands, and ears. This should be done before going on to the more time-consuming, expensive, and occasionally painful types of examination . . . . For example, it is distressing to hear a student state that he must know the results of cardiac catheterization before giving an opinion in a case of suspected congenital heart disease, and to discover that he has overlooked many diagnostic clues when performing the physical examination. —J. Willis Hurst and Embree Blackard: Inspection and Palpation of Pulsations on the Front of the Chest. *Connecticut Medicine,* November 1958.

MILITARY INDUSTRIAL HYGIENE

U. S. Armed Forces Program in Far East

E. ELBRIDGE MORRILL, Jr., M. P. H.

IN 1954, the Surgeon General, Department of the Army, made a request of the Surgeon General, U. S. Public Health Service, for the assistance of an industrial hygiene engineer to conduct an initial survey of the Army Forces Far East (AFFE) installations in Japan and Okinawa to determine whether or not initiation of an industrial hygiene program was warranted in the Far East. Mr. Henry N. Doyle, then Senior Sanitary Engineer, Occupational Health Program, U. S. Public Health Service, made the survey in March and April of 1954.[1]

This survey took into consideration the actual and potential health hazards confronting a work force of about 190,000 Japanese nationals employed in installations of the U. S. Armed Forces as well as the numerous Army, Navy, and Air Force military and civilian personnel holding supervisory positions. The terms of employing Japanese nationals under the Master Labor Contract also had to be considered.

Arrangements for employment, payment of wages on a reimbursable basis, and administrative details have been negotiated periodically between the U. S. Armed Forces and the Procurement Agency, an instrument of the Japanese Government, through the master labor contract. Under its terms, the Agency has been responsible for administering the Workmen's Compensation Act and Workmen's Health Insurance, for making health inspections, and for giving physical examinations to the Japanese nationals employed. The funds required for these responsibilities have been furnished to the Agency by the U. S. Armed Forces through an administrative fee. This fee amounts to about $20 per month per employee. Approximately one third of the fee covers items of medical importance. The contract has been based in part on the safety and health experiences at American military installations during the previous year. Thus, in essence, the costs of illnesses and accidents have been borne by the U. S. Armed Forces. Also, according to the terms of the Master Labor Contract, the health insurance premiums have amounted to approxi-

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From 5th Epidemiological Flight, U. S. Air Force, APO 959, San Francisco, Calif.
Presented at 20th annual meeting of the American Conference of Governmental Industrial Hygienists, Atlantic City, N. J., 21 April 1958.

mately 5 per cent of the worker's gross pay, and have been shared equally by the employer (U. S. Armed Forces) and the employee.

For all practical purposes, most of the American installations have constituted a Japanese industry and, therefore, must abide by Japanese labor laws. The employees have been entitled to all the benefits of the labor laws including Workmen's Compensation, Workmen's Health Insurance, and those providing for extra hazardous pay allowances. Another factor Mr. Doyle considered was that there were no Japanese industrial hygiene engineers, and only a few Japanese physicians with formal training in industrial medicine.

In view of his findings, Mr. Doyle recommended that a minimum industrial hygiene program be initiated in the Far East even though AFFE installations were in a sense temporary, and the expenditure of funds to provide facilities comparable to installations in the U. S. could not be justified. Acting upon these recommendations, an industrial hygiene program was established by the U. S. Army in the Department of Chemistry, 406th Medical General Laboratory, near Tokyo, Japan to render assistance to the Army, Navy, and Air Force installations in Japan, Korea, Okinawa, and the Philippines. Personnel assigned to this program included an industrial medical officer (Lieutenant Colonel Charles W. Kraul, MC, USA), a Department of the Army civilian industrial hygiene engineer (the author), and several chemists as well as officers, enlisted men, and Japanese personnel. Engineering field sampling equipment was procured and laboratory facilities were provided.

In addition to this program, the U. S. Air Force had a sanitary and industrial hygiene engineering officer assigned to the large Air Materiel Depot in Japan, and two other sanitary and industrial hygiene engineering officers assigned to the 5th Epidemiological Flight, the preventive medicine unit for the Far East Air Forces. This unit was commanded by an Air Force Medical Corps colonel who had formal training and experience in the field of industrial medicine.

Safety personnel, either American military or civilian, have had an important role in the health and safety of the industrial working population, and have worked closely with the medical personnel.

The program has been designed largely for the Japanese nationals employed by the U. S. Armed Forces, but the program has been limited in scope for many reasons. One major factor has been that the Japanese physicians at the Japanese dispensaries, located on each installation, have not been directly responsible to the respective U. S. commanders. Also, the primary interest of the Japanese physician has been curative rather

than preventive medicine. Therefore, the medical requirements of a complete program have been somewhat lacking.

INDUSTRIAL ACTIVITIES IN THE ARMED SERVICES

The principal industrial operations in the Far Eastern installations of the U. S. military forces have been the rebuilding, repairing, and maintaining of vehicles, aircraft, buildings, and equipment used by the three services. The maintenance activities at Air Force bases include many shops similar to those reported by Meyer[2] for Strategic Air Command bases. These shops are electrical, electroplating, hydraulic, battery, jet engine overhaul and testing, jet engine test stands, jet aircraft run-up pads, motorized and ground equipment repair, and liquid oxygen plants. In the field maintenance shops, a wide variety of chemicals are used including solvents. Many of these may create health hazards for industrial workers unless good control measures are provided.

Other industrial operations observed at air bases in the Far East include spray painting, vapor degreasing, doping, and welding. Inert gas (argon) welding on aluminum and stainless steel is done at most bases. The primary hazard is the exposure to ozone, but other arc-welding health hazards may exist.[3]

The largest industrial unit of the U. S. Navy Fleet Activity at Yokosuka, Japan, is the Ship Repair Facility. This unit is composed of 14 major shops including planning and design, ship fitting, welding, sheet metal, gasoline and diesel engines, boiler making, electric, pipe, carpenter, paint spraying, and docking shops. This facility repairs naval vessel engine parts and overhauls engines. The Public Works Department has a large dynamometer shop, as well as paint spraying, battery, and welding shops.

The Army has several large ordnance depots whose industrial function is primarily the rebuilding of military vehicles. The U. S. Army Signal Corps, Quartermaster Corps, and Engineering Corps also have large depots. The shops at these depots include chemical cleaning processes, sandblasting, electroplating, welding, spray painting, vapor degreasing, dynamometer test shops, and others.

In addition to these industrial shops throughout the Far East, the military services have hospitals and dispensaries whose medical and dental roentgenographic units may present a hazardous work environment.[4] Other hazardous conditions commonly noted that may cause an occupational illness or reduced efficiency are inadequate lighting conditions and exposures to high temperatures and humidities.

HEALTH HAZARDS AT FAR EAST BASES

Misuse or Nonuse of Respirators

The misuse or nonuse of the proper type of personal protective equipment, particularly the respirator, has resulted in fatalities, near fatalities, and serious illnesses. In addition, it has been observed that the respirators are not always properly fitted to the worker's face.

Gasoline storage tank cleaning. On several occasions illnesses have occurred in connection with gasoline storage tanks.

The health of workers who enter or clean inside gasoline storage tanks may be endangered by the exposure to atmospheres containing tetraethyl lead, gasoline vapors and, possibly, a deficiency of oxygen.[5] This type of work can be made safe by the use of proper equipment.

At one underground petroleum, oil and lubricants (POL) terminal, some workers were accidentally exposed to leaded gasoline vapors when they wore canister masks for organic vapors. Canister masks are *not* suitable for this type of work.[5] Previously, the tank had been flushed with sea water. When making the repairs there was a continuous rush of air through the tank; the force was sufficient to blow over a 5-gallon can. The tunnel bay had been tested for gasoline vapors and was reported not to be in the explosive range. A health hazard may still be present even though the vapors are not in the explosive limits.[5] A Japanese physician stated that the workers had symptoms of nervousness, dizziness, weakness of the arms, nausea, and anxiety. Blood samples and 24-hour urine specimens were obtained from the four workers affected. The work history, symptoms, and laboratory findings for one of the workers were compatible with a diagnosis of moderate poisoning due to tetraethyl lead. In another case there had been exposure to lead but the diagnosis of tetraethyl lead poisoning was neither established nor justified from the evidence at hand. The other two workers did not have a severe exposure.

Another worker, equipped with an ordinary military gas mask and carrying an "all purpose" canister, entered a deep concrete-lined open pit that contained gasoline and its sludge. This pit, where the control valves were located, was between two subterranean gasoline tanks. After the worker had carried two or three bucketfuls of the pit contents to the surface, he gave an indication of being very ill and nearly unconscious. He was first taken to a local dispensary and later to a nearby hospital. He lost two days' time from work. No clinical data were received from the Japanese dispensary or hospital.

About a week later at the same depot, two more workers wearing the same type of mask had similar experiences after entering a subterranean gasoline storage tank. This tank had about three inches of gasoline and sludge on the bottom.

Figure 1. Oxygen deficiency in manhole of an underground drainage system.

Following these incidents, industrial hygiene personnel made recommendations for proper control measures including personal protective equipment that would make the work environments safe. After these occurrences, a request to approve special hazardous pay allowances for all Japanese POL workers at the American military installations was received. The request was not approved in view of recommendations made by the industrial hygienists. This resulted in an estimated annual savings of $250,000 to the U. S. Armed Forces for hazardous pay allowances.

Oxygen deficiency exposure. Three Japanese farmers died and one Air Force medical corpsman fainted after descending into a manhole (fig. 1). This manhole, located in an American dependent housing area, was part of an underground drainage system that ran from a lake adjacent to and outside of the dependent housing area to the local farms on the other side of the housing area. The manhole, approximately 4 feet in diameter and 15 feet deep, was made of corrugated sheet metal and was supported by concrete fill. It was covered with a concrete lid.

Before this incident it had not been entered for a period of over one year. A 67-year-old farmer descended into the manhole, immediately became unconscious, had convulsions and died at the bottom of the manhole within minutes. His son, age 48, went into the manhole and died in the same manner. Another son, age 47, decided to enter the manhole but, before descending, he obtained an all-purpose canister-type gas mask from the local air base fire station, and tied a rope about himself. Upon arrival at the bottom of the manhole, he also became unconscious. He was pulled to the surface and placed in an ambulance, but was dead upon arrival at the local dispensary. The medical corpsman decided he would enter the manhole but would hold his breath and also wear the same mask. Upon reaching the bottom, he slipped, forgot to hold his breath, and immediately fainted. He was pulled to the surface with a rope and immediately thereafter had epileptiform convulsions.

A week later, vapor tests were made with a combustible gas indicator. These tests all gave negative findings. Six air samples were collected from the bottom of the manhole with a suction pump, air sampling flasks, and long sampling tube. Laboratory analyses revealed that the oxygen content was about 2 per cent and carbon dioxide concentration was 11 per cent. These analyses were augmented by a complete infrared gas analysis of the air samples, but no detectable amounts of "trace contaminants" were found. The history of the accident, the clinical signs and symptoms exhibited by the victims and airman, the mode of death, and the laboratory findings were all consistent with the diagnosis of fulminating anoxia.

Solvent Hazards

Carbon tetrachloride. Mr. Doyle reported in his survey findings[1] that the largest single potential health hazard was the widespread use of carbon tetrachloride. For all practical purposes, this solvent is no longer used in the Far East except as a fire extinguishing agent, and in a few rare work environments where its use is essential. As a matter of fact, other solvents are now even preferred for many of the jobs for which carbon tetrachloride was formerly thought to be essential.

The relatively rare use of carbon tetrachloride has been brought about largely through close liaison between industrial hygienists and supply personnel, continual educational programs, and certain restrictions placed on the use of the solvent by medical military regulations. In the Air Force, the base surgeon must approve the use of certain toxic chemicals such as carbon tetrachloride.

Although the exposure to carbon tetrachloride from industrial operations has been almost eliminated, there have been a few incidents of exposure and one known death attributed to inhalation of its vapors. The latter occurred in Korea in 1957 when an officer used the solvent to clean up soot in his quarters after

a stove cleaning job. His exposure was estimated to be about 30 to 35 minutes. He died in an Army hospital a few days later. Two other persons had approximately the same exposure but did not die.

Personnel of one military installation fire department were briefly exposed to an estimated concentration of 7500 ppm, when they entered an unventilated room in which more than two gallons of carbon tetrachloride had leaked from a metal container over a weekend. This incident did not prove to be serious.

Trichloroethylene. This solvent is now probably used more extensively than carbon tetrachloride was prior to 1955. An excellent technical bulletin[6] was published by the Army in 1955 on the operation of vapor degreasers using trichloroethylene. It has been an important source of data for the hazards involved, proper operating instructions, and control measures.

At one depot, vapor degreasing was done outdoors in a homemade tank heated by steam. The tank consisted of three 55-gallon drums that were welded end to end with the axis in a horizontal direction. No engineering control measures had been provided. Air pollution was detectable 15 to 20 feet away. This tank was replaced by another one (fig. 2) fabricated locally. It was provided with a water condenser to prevent the vapors from leaving the tank, with a "sight funnel" to facilitate temperature measurement of the water effluent, and with tank covers. These measures adequately controlled the exposures.

It was observed at one installation that a vapor degreaser (fig. 3) had been provided unnecessarily with an overhead, hooded, mechanical exhaust ventilating system that actually increased the health hazard by exhausting the vapors up through the workers' breathing zone. Another vapor degreaser was greatly affected by drafts over the tank from a nearby window during the summer months. As is known, such drafts should not have a velocity greater than 50 feet per minute especially when directed lengthwise.[5]

Another hazard associated with the vapor degreasing machine and noted in the Far East is the cleaning of the sludge accumulated inside the vapor degreaser tank without proper protective equipment, namely, the air-supplied respirator. Other respirators do not provide adequate protection. Even after a tank has been cleaned there still may be high concentrations of the solvent vapors in the tank or an oxygen-deficient atmosphere.[7] In one unusual incident, four workers had used the proper protective equipment while cleaning a trichloroethylene-vapor degreasing tank. Upon completion of the cleaning job, the foreman went down inside the tank without wearing a respirator to inspect the job. He immediately became unconscious. He was followed by two other workers, neither of whom wore a respirator. Each worker immediately became unconscious. They were brought to the surface and all three completely recovered, but this incident could have been fatal.

Figure 2. Vapor degreaser installed outside a depot building.

In addition to vapor degreasing with trichloroethylene, there has been a widespread use of the solvent in the cold state, at room temperature. This may be hazardous when workers are exposed to the solvent vapors or have skin contact with the solvent.

Other solvents. Solvents such as the petroleum distillate, Stoddard (commonly known in the military services as P-S-661), kerosene, and diesel oil have been widely used. In some instances, workers have been exposed to aerosol mists from spraying operations or when blowing off excess solvent from degreased parts with compressed air. These conditions have made it necessary to provide mechanical exhaust ventilating systems with hoods. Canopy hoods (fig. 4) are not considered the proper type. These do not control the worker's exposure to the aerosol mists of the solvent when excess solvent is blown off with compressed air. The lateral exhaust hood is more desirable. In addition to

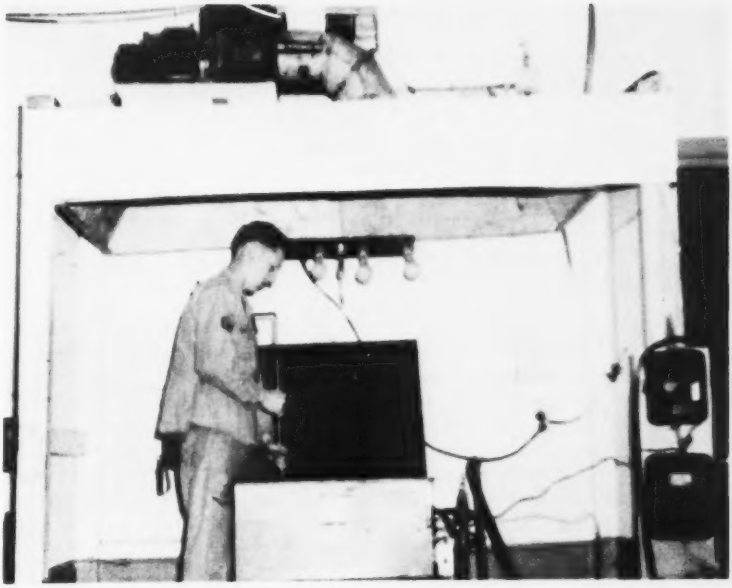

Figure 3. Vapor degreaser with canopy hood exhaust system.

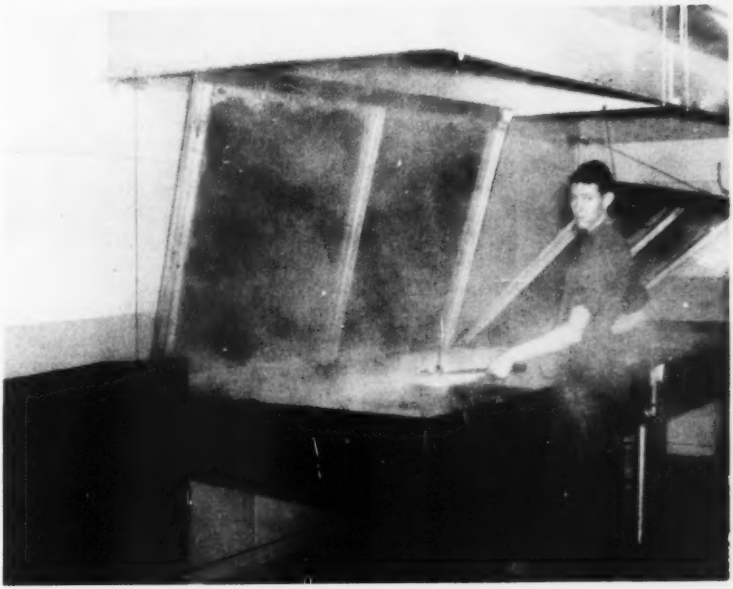

Figure 4. Canopy hood with mechanical exhaust ventilation.

the inhalation hazard, several cases of dermatitis have been noted from the use of these solvents. It was reported that in one shop employing 200 workers, where diesel oil was used extensively for cleaning machinery parts, over 50 per cent of the workers at one time had dermatitis.

Carbon monoxide and other exhaust gases. At one installation an attempt had been made to discharge the exhaust gases from an internal combustion engine by gravity flow through an exhaust extension pipe. The small pipe from the engine was inserted into a pipe of larger diameter without providing a tight connection or seal. This opening allowed some of the exhaust gases to escape into the work shop.

In another similar shop, a control measure in the form of a mechanical exhaust ventilator had been installed. This was presumed to be satisfactory. The control was a manifold arrangement for the exhaust pipe extensions with an exhaust fan in the system. At all engine areas, with the exception of the area near number three engine, with a total of 16 engines running simultaneously, the carbon monoxide (CO) concentration was well below the threshold limit value (TLV) of 100 parts per million (ppm), adopted by the American Conference of Governmental Industrial Hygienists for a daily eight hour exposure.[8] The CO concentration in the immediate vicinity of number three engine was about 200 ppm. Further investigation revealed that the discharge end of the exhaust system was located just outside the building near number three engine about 10 feet above ground level. This condition permitted some of the exhaust gases to re-enter the building through the window nearby. By merely extending the discharge end of the stack above the building, the hazardous condition was readily corrected.

At another shop that was a dynamometer testing operation, exhaust gases were discharged by gravity flow up through a tall stack. Inside the shop, however, the exhaust extensions from some of the engines were not tightly fitted. Tests made near one engine revealed a CO concentration of 1,000 ppm. After the cause had been eliminated, further tests showed the CO concentration to be well below the TLV level.

A near fatality occurred at an air base when a pilot, resting in unventilated crew quarters, was poisoned by carbon monoxide. The CO source was traced to a gasoline-operated Herman Nelson heater being used to heat the quarters. The heater was located outdoors but the heated air, conveyed through a flexible canvas duct into the room, had become contaminated from the exhaust gases. These heaters were not intended for use in confined unventilated areas, but for large areas such as hangars or tents where there would be sufficient natural ventilation to control a carbon monoxide hazard.

Non-occupational carbon monoxide poisoning incidents in Japan, similar to those reported in U. S. communities,[9] have

resulted from the use of faulty domestic gas appliances in private dwellings that are owned by Japanese and occupied by U. S. military personnel. These appliances use bottled gases such as propane, illuminating gas, or other types of fuels such as charcoal for the small Japanese heaters called "hibachies." Hot water heaters using gaseous fuels have been particularly dangerous unless the heaters have been properly vented to the outside atmosphere.

On Easter Sunday, 21 April 1957, between 0500 and 0800 hours, Mrs. F. and four of her children (a boy, 5 years of age, and three girls, 3, 8, and 10 years of age) were in the kitchen and adjacent living room. In this period it was estimated that the hot water heater, burning propane gas, was used for about 25 minutes to heat water for washing dishes, showers, and for the washing machine. At about 0800 hours, Mrs. F. called to her husband, who was asleep in a bedroom some distance from the kitchen, informing him that something was "wrong" with the children. Mrs. F. felt dizzy and lightheaded and the children were unconscious. Captain F. immediately rushed the family to the hospital. The 10-year old girl remained in the hospital and was released the next day. The other children were released after examination. The 8-year old girl complained of a severe headache after she came home from the hospital. She was taken back to the hospital but was again released and returned home. The boy complained of a headache late Sunday afternoon. The 3-year old girl vomited when she was carried out to the car and vomited again on the way home from the hospital. Fortunately, all members of the family recovered.

A study was made of the environment on 25 April. Tests for carbon monoxide were made with a squeeze-bulb type CO detector near the sink area of the kitchen, after the hot water heater had been turned on for about five minutes. The CO concentration was nearly 1,000 ppm. It was observed that the heater had been improperly vented to the outside atmosphere. The initial diameter of the exhaust pipe was about six inches; however, it was reduced to about two inches before going through the outside wall. This condition apparently created a back pressure and forced the exhaust gases into the kitchen environment. Recommendations were made at the time to have the exhaust pipe diameter six inches throughout its length and to install a small wall exhaust fan in the kitchen. After the exhaust pipe had been corrected, tests for carbon monoxide were all negative.

Other Exposure Hazards

Noise hazards. Exposures to hazardous noise levels, particularly from jet aircraft, have been of concern to the U. S. Air Force the past few years. Many studies on this problem have been conducted at Wright-Patterson Air Force Base, Ohio, and at other bases in the U. S. Recently, the Air Force published a regulation[10] to be used as a practical guide for controlling exposures to aircraft and other hazardous noise sources.

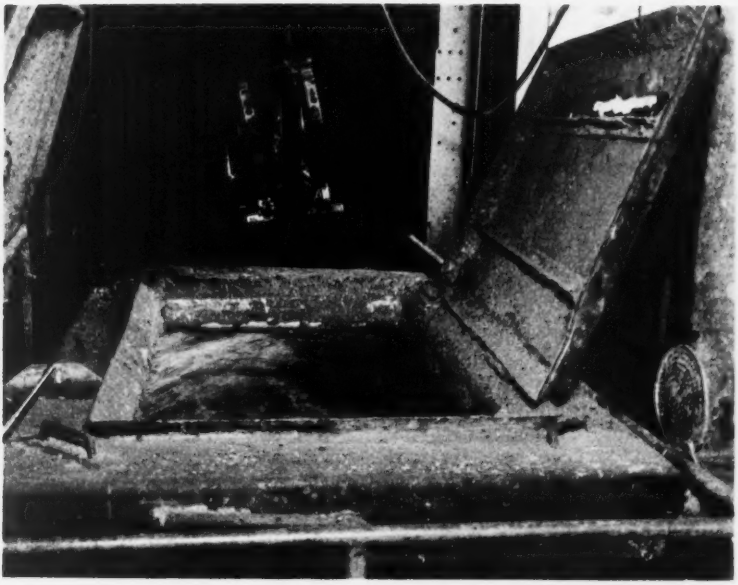

Figure 5. Vehicular radiators immersed in a large tank of molten lead.

This regulation gives instructions for designating hazardous noise exposures and work environments; hazardous noise exposure criteria; degree of protection afforded by personal protective devices; criteria for determining hearing loss of individuals; and instructions and criteria for assigning, reassigning, and providing medical treatment for individuals with specified hearing loss. This regulation has been very useful to flight surgeons and industrial hygienists who have been actively engaged in a hearing conservation program in the Far East, including indoctrinating personnel in the undesirable effects of noise, issuing personal protective devices such as ear plugs and ear muffs or helmets, making noise surveys, and periodic monitoring audiometry.

Lead exposure. Lead has been used at several installations; the common use has been as a soldering agent. At one depot, vehicle radiators were immersed in a large tank of molten lead to seal leaks (fig. 5). After the radiators were allowed to drain, the excess lead was removed by an air hose. A canopy hood (fig. 6) with mechanical exhaust ventilation was provided for this operation. It should be pointed out that this type of hood is not considered a satisfactory control measure where the air contaminants are exhausted up and through the breathing zone of the worker (fig. 7). Studies made with an electrostatic precipitator revealed that the exposures were considerably above the TLV for lead for a daily eight hour exposure. Although the

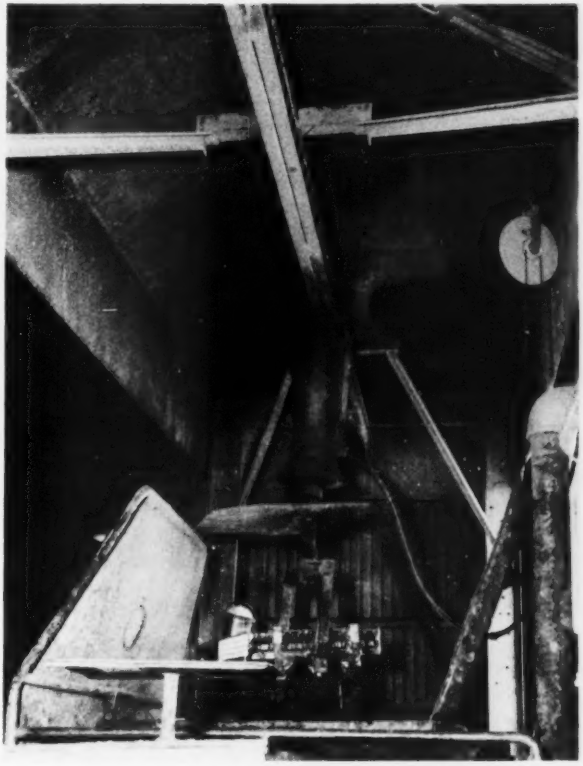

Figure 6. Canopy hood with mechanical exhaust system over molten lead dip tank shown in figure 5.

work was not performed every day, nor usually even for a full day, it was considered advisable to modify the exhaust system to that of a lateral exhaust system (fig. 8). Tests and measurements made after the ventilation system was modified revealed that the hood more than adequately controlled this lead hazard. Very little new material was required to modify the hood effectively.

Ionizing radiation exposure. Several exposures to ionizing radiation have been noted. At one depot, two workers were engaged in the inspecting, testing, and renovating of used and sometimes broken luminous markers containing radium sulphate, a radioactive substance. There were two types of hazards involved: (1) an external hazard from exposure to gamma rays, and (2) an internal hazard from inhalation of radioactive radon gas, and possible ingestion or skin contact with the radioactive substance.

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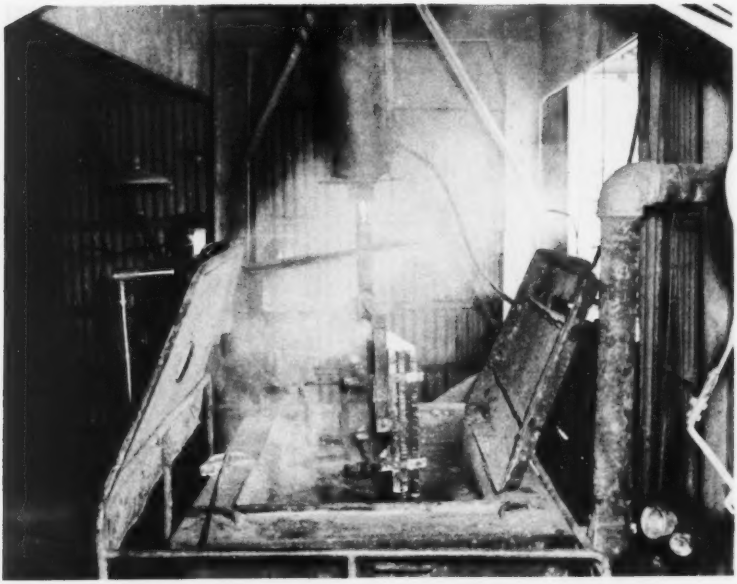

Figure 7. Ventilating system exhausting lead fumes.

Figure 8. Canopy hood replaced by a lateral exhaust hood that adequately controlled workers' exposures to lead fumes.

For an individual marker, the external hazard would not be significant but as several thousand markers (up to 10,000) were stored in open boxes inside an isolated warehouse, the external hazard was significant to workers inside the building. Measurements, made with a RADIAC set roentgen meter, indicated a worker would receive in less than four hours exposure time the maximum *weekly* permissible dose adopted by the National Committee on Radiation Protection. A closely supervised individual monitoring program was initiated using the self-reading pocket dosimeters (0-200 mr) to determine when an individual worker was approaching his maximum permissible weekly dose. The internal hazard could not be evaluated as suitable sampling apparatus was not available.

A worker in an optical repair shop at another depot had found a few of these luminous markers. He used them as a source of luminous material for touch-up work on clock dials and hands but was unaware of the potential radiation hazards. No exhaust ventilation was provided for this shop.

In a routine survey of a dental clinic, it was observed that a leaded screen had not been provided to protect the technician from exposure to the primary beam and to scatter radiation. The technician and his assistant, each wearing a pocket dosimeter, were monitored for their radiation exposure. One day's exposure was over one-third of the maximum permissible weekly dose. A protective screen was provided later.

SUMMARY

The incidents presented are a few of the highlights of the industrial hygiene program in the Far East. The circumstances under which potential health hazards operate to produce deleterious effects on health of workers are legion. The only safeguards are proper design of shops, properly designed ventilating systems, proper operating procedures, and an awareness by the workers, supervisors, and maintenance personnel of the potential hazards. This can be accomplished only by continuous education of all persons concerned.

REFERENCES

1. Doyle, Henry N.: *Industrial Hygiene Survey of Army Forces Far East Installations.* Official Report of Department of Health, Education, and Welfare, 14 June 1954. (Unpublished report.)

2. Meyer, A. F., Jr.: Occupational health program of Strategic Air Command. *A. M. A. Arch. Indus. Health* 14: 107-113, Aug. 1956.

3. Schrenk, H. H.: New welding techniques require re-investigation of possible new or different health hazards. *Indus. & Engin. Chem.* 47: 103A-105A, Apr. 1955.

4. *Medical X-Ray Protection.* Department of Air Force Manual 160-10; Department of Army Technical Bulletin, Med. 62; 7 May 1957.

5. *Cleaning Petroleum Storage Tanks.* Accident Prevention Manual 1-B. 2d edition. American Petroleum Institute, New York, N. Y., Oct. 1950.

6. *Vapor Degreasing Equipment: Operation and Maintenance.* Department of Army Technical Bulletin, Ordnance 584; 5 April 1955.

7. Patty, F. A. (editor): *Industrial Hygiene and Toxicology.* Interscience Publishers, New York, N. Y., 1952. Vol. 2, pp. 1094-1098.

8. Threshold limit values for 1957; adopted at 19th Annual Meeting American Conference of Governmental Industrial Hygienists. St. Louis, Apr. 20-23, 1957. *A. M. A. Arch. Indus. Health* 16: 261-265, Sept. 1957.

9. Trichter, J. B., and Helpern, M.: Accidental carbon monoxide poisoning due to domestic gas appliances and gas refrigerators; problem in New York City and its control. *Am. J. Pub. Health* 42: 259-267, Mar. 1952.

10. *Hazardous Noise Exposure.* Department of Air Force, Regulation 160-3; 29 October 1956. 24 pp.

IN DEFENSE OF COMIC BOOKS AND TV

Despite the disparaging attitude of many educators toward the ubiquitous comic books and the commercial television set, the facts are that, for better or worse, these have become instruments of education. . . .The story is told of two third-grade boys at recess who were describing with considerable accuracy the automotive world about them. Looking skyward they assessed the type and capabilities of a jet bomber flying overhead. Then, with equal facility they debated the potentials of a new model car which had undergone recent engine modifications. Their further comments were interrupted by the ringing of the school bell, and one of the lads was heard to say, "Aw, heck! Guess we've got to go in and string some more of those darned beads." This fact of extracurricular education was brought home to me rather forcefully one evening by the erudite comments of my 10-year-old son, after we had listened to an hour's discourse by Dr. Hubertus Strughold. . .on the possibility of life on other planets. . .directed primarily toward the college student. . .Despite the evident interest of my son in the subject matter, I was convinced that he spent the hour floundering far beyond his intellectual depth. . . .On the way home, in the condescending manner of a parent, I was attempting to salvage the apparently wasted evening and had reached the matter of the silicon atom when my son interrupted to inform me that he was familiar with the essential requirements of terrestrial life and that the characteristics of the silicon man were well known to him. A surprised father then listened to a second and equally factual lecture on the problems of life in space. The source of this information was the comic book and the television. It was difficult on this particular occasion to criticize media of communications that had placed a fifth grade student in a frame of mind capable of intelligent participation in a presentation for adults by a world authority on space medicine.—Melvin A. Casberg: Knowledge Comes But Wisdom Lingers. *The Journal of Medical Education,* September 1958.

PLEURAL BIOPSY AS A DIAGNOSTIC METHOD

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THE importance of a definitive diagnosis in a patient with pleurisy and effusion is unquestionable, if such a patient is to be treated intelligently. Well-documented clinical studies indicate that a majority of previously healthy patients with idiopathic pleurisy and effusion eventually will develop some form of tuberculosis within five years. Sixty-five per cent of such persons among military personnel in one series developed tuberculosis.[1] The findings in general population studies vary from 16 to 50 per cent. It has been estimated that 90 per cent of idiopathic pleural effusions are tuberculous in origin.[2] Skaggs and Smiley[3] reported 50 patients treated for an average of 200 to 370 days with bed rest following an episode of pleural effusion; within 6 years they suffered a 10 per cent mortality from disseminated tuberculosis. Idiopathic pleural effusion is not a benign condition. Specific and adequate therapy should be mandatory. It is not desirable, however, to treat patients showing the signs and symptoms only without a positive diagnosis. It would be most gratifying to establish a specific diagnosis and thereby institute the necessary, prolonged tuberculosis therapy only in proven tuberculous cases. A method of excluding tuberculosis as the etiologic agent in a given case of pleurisy and effusion would be equally desirable.

As the medical and surgical chest disease center for the United States Army in Europe, this hospital frequently is faced with the problem of diagnosis, treatment, and disposition of patients presenting with pleurisy and effusion. We have been interested in the optimistic reports which have appeared in the recent literature, advocating surgical pleural biopsy as an aid in the diagnosis of pleural effusions.[4-6]

CASE STUDY MATERIAL

Twenty-five patients admitted with pleurisy and effusion were studied carefully and then offered pleural biopsy as a possible means of expediting diagnosis and treatment. On admission,

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complete medical evaluations, including the usual roentgenograms, thoracentesis (when possible), skin tests, routine blood cell counts, urinalysis, and culture of pleural fluid, sputum, and gastric washings, were carried out. Agglutination titers, blood chemistry studies, L. E. cell preparations, and bronchoscopy were performed when they were thought to be of diagnostic value. When evidence of generalized illness abated, a pleural biopsy was performed. No patient with a lung parenchymal lesion, or with a proven diagnosis, was operated upon. The patients ranged in age from 17-47 years, with an average of 26 years. Twenty-one were Caucasian and four were Negro. The onset of symptoms before biopsy was three weeks to four months with an average of two months. At the time of admission, only 12 of the 25 patients had residual pleural fluid sufficient for successful thoracentesis. Pleural fluid examination revealed four specimens with predominant neutrophils, one with 72 per cent eosinophils, and the remainder demonstrated predominant lymphocytes.

All patients had positive reactions to intradermal tuberculin tests with PPD except one, and this one exception converted to positive two months later. The sedimentation rates varied from 4 to 55 mm per hour, with no relation to clinical condition or operative findings.

METHOD

Surgical biopsy was performed under general endotracheal anesthesia. In the first 15 patients a 12 to 15-cm intercostal incision was made over the area of x-ray density. Generally a 2 by 4-cm biopsy specimen of pleura was obtained. Later in the study, it was thought that a larger incision with complete exploration of the chest cavity would be more revealing. Incisions in the last 10 patients, therefore, were larger than 15 cm and sufficient to adequately explore the entire pleural cavity. In two patients, decortication was carried out at the time of the biopsy procedure.

RESULTS

Acid-fast bacilli were isolated by smear or culture in only 8 of the 25 patients operated upon (table 1). Thirteen patients demonstrated pathologic changes usually associated with tuberculosis. Fibrosis, epitheliod cells, and giant cells were noted in inconstant relative amounts. Caseation was found in four patients. Acid-fast bacilli were seen on smears on four occasions, two of which failed to grow on culture.

Fibrous tissue and chronic inflammatory cells were the predominant findings in those 10 biopsy specimens which we have labeled "nonspecific." Two of these pathologic patterns grew out acid-fast bacilli on culture, and are included in the definitely diagnostic group above.

Six patients received streptomycin sulfate or isoniazid-para-aminosalicylic acid before admission to our hospital. Culture

of biopsy material in two of these demonstrated acid-fast bacilli as well as the typical findings of tuberculosis on microscopic sections. The pathologic findings in the remaining four were comparable to the "nonspecific" untreated cases.

TABLE I. *Results of biopsy performed in 25 patients with pleural effusion*

Findings	Number	Per cent
Positive diagnostic biopsy*	8	32
Suggestive tuberculosis by microscopic section (No *Mycobacterium tuberculosis* seen or cultured)	7	28
Nonspecific biopsy	10	40

*Two of these cases had nonspecific pathologic changes but positive cultures of tissue.

Of interest is one patient who, though found to have a "nonspecific" specimen, eventually had a positive acid-fast bacilli culture from pleural fluid taken prior to surgical biopsy. Another patient with a negative pleural biopsy, developed tuberculosis of the bone at another hospital, six months later. One patient who converted from a negative to a positive PPD skin test during hospitalization had a nonspecific biopsy.

The larger incision, with exploration of the entire pleural cavity, produced no improvement in our diagnostic results.

DISCUSSION

It is apparent that in only 32 per cent of the patients was firm diagnosis of tuberculosis obtained by pleural biopsy. Additionally, in 28 per cent of the patients (exclusive of the definitely diagnostic group) a "typical" pathologic picture of tuberculosis was seen under the microscope, but stains and cultures for acid-fast bacilli were negative. Hence, if we are permitted to include the latter two categories, pleural biopsy gave only a 60 per cent positive or highly suggestive indication that tuberculosis was the cause of the pleurisy and effusion. No other cause was found in any case. Disappointing to us was the fact that definitely two, and probably three, of the 10 "nonspecific" biopsies subsequently demonstrated evidence of tuberculosis as the cause of the pleural effusion.

Medical follow-up of patients with negative biopsies over five years would indeed be important information. All patients with negative biopsies in this series, with one exception, have been started on an ambulatory course of anti-tuberculosis medication.

Of necessity, our patients are in a younger age group and thus we cannot evaluate pleural biopsy in those over 40 years of age. But in view of past clinical experience, we do not believe that negative pleural biopsies prove that the etiologic agent is not the *Myco. tuberculosis*. We believe that there is no advantage in pleural biopsy over a presumptive diagnosis of tuberculosis

in patients under 40 years of age with an idiopathic pleural effusion. It would seem wise to reserve surgical pleural biopsy for those patients with a negative tuberculin test or in whom there is good reason to suspect some etiologic agent other than tuberculosis. Pleural biopsy has indeed been disappointing in our hands as a means of ruling out tuberculosis.

SUMMARY

Clinical experience in the early pleural biopsies in 25 patients with idiopathic pleural effusions led to a bacteriologic diagnosis of tuberculosis in 8. Granulomatous changes suggestive of tuberculosis were found in 7. In 10 patients the findings were nonspecific. Of the 10 with negative biopsies, the subsequent course indicated tuberculosis as the etiologic agent in 3.

Pleural biopsy as a diagnostic aid in excluding tuberculosis has been disappointing in our hands, and it is suggested that it be reserved for those patients with persistently negative tuberculin reactions and for those cases in which a cause other than tuberculosis is considered.

REFERENCES

1. Roper, W. H., and Waring, J. J.: Primary serofibrinous pleural effusion in military personnel. *Am. Rev. Tuberc.* 71: 616-634, May 1955.

2. Skaggs, J. T., and Smiley, G. W.: Course of idiopathic pleural effusion in 50 patients. *Am. Rev. Tuberc.* 72: 647-652, Nov. 1955.

3. Stead, W.; Eichenholz, A.; and Stauss, H. K.: Operative and pathological findings in 24 patients with syndrome of idiopathic pleurisy with effusion, presumably tuberculous. *Am. Rev. Tuberc.* 71: 473-502, Apr. 1955.

4. DeFrancis, N.; Klosk, E.; and Albano, E.: Needle biopsy of parietal pleura. (Medical Intelligence section) *New England J. Med.* 252: 948-949, June 2, 1955.

5. Berg, P.; Frenkel, E. P.; Shiver, C. B., Jr.; Caris, T. N.: Pleurisy with effusion due to remote trauma; differential diagnosis for acute idiopathic pleural effusion. *U. S. Armed Forces M. J.* 8: 31-45, Jan. 1957.

6. Donohoe, R. F.; Katz, S.; Matthews, M. J.: Pleural biopsy as aid in etiologic diagnosis of pleural effusion; review of literature and report of 132 biopsies. *Ann. Int. Med.* 48: 344-362, Feb. 1958.

NOT THE PILL BUT THE MANNER

Reason and common sense dictate that something be done to curb the excessive use of tranquilizers. The idea of a completely tranquilized society is an awesome one. We know of instances where drivers and even pilots were given the drugs. Notwithstanding their potent and sometimes dangerous mental and physical effects, giving a pill to a patient can be poor medical practice when it is given as a substitute for the physician's time and personal assistance. We all like to relieve our patients' symptoms but treating the smoke never puts out the fire. There can never be a substitute for a sympathetic approach and a sincere interest in the patient. The currency of patient-doctor relationship is not in the pill but the manner.—Pseudo Panacea: *USAFE Surgeon Comments*, October-November 1958.

TOPICAL OCULAR THERAPY

WILLIAM S. TASSMAN, *Captain, USAF (MC)*

AT the present time we have several antibiotic and chemotherapeutic drugs available for topical ocular therapy, with the result that the choice of the proper agent is not a simple one. Rational use of bacteriostatic drugs presupposes an accurate diagnosis. Conjunctival infection is closely simulated by allergy, acute glaucoma, and iritis. These noninfectious entities do not, of course, benefit from antibiotics.

Response to the proper topical antibiotic is expected in acute bacterial conjunctivitis, bacterial corneal ulcer, marginal blepharitis, and hordeolum. Acute bacterial conjunctivitis is the commonest eye condition treated with antibiotics and responds well to them. Therefore, if a conjunctival injection fails to subside within two days of adequate therapy, the probability of misdiagnosis is great.

Adequate therapy is most important. The drug chosen should be applied in adequate concentration and with enough frequency to achieve the desired healing effect. A very common mistake is the homeopathic prescription of one drop to be instilled three times a day. For full effect, drops should be instilled at hourly intervals or even more often.

Ointment vehicles may be used for night instillation. The resulting blurred vision and greasy lids make drops preferable during the day. The latter are easier to instill in struggling children and are more efficacious because ointments may delay ocular healing.[1] This is important where the corneal epithelium has been denuded. Ointments, with or without antibiotics, will slow re-epithelization.

Once the infection has subsided it is important to maintain therapy for at least three days after the conjunctiva has become white. During this period the frequency of administration may be decreased to three or four instillations a day. Failure to follow such a regimen may result in a second flare-up. The eye may appear quiet clinically but the infection may only have been suppressed and not eradicated.

In the common minor infections of the eye, cultures, scrapings, and stains are neither necessary nor economically feasible. Should difficulty be encountered in differentiating allergic and

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bacterial conjunctivitis, microscopic examination of a stained smear is most helpful. The expense of sensitivity studies is clearly warranted in cases of corneal or intraocular infection, orbital cellulitis, and chronic infections resistant to previous therapy. In serious infections, treatment must be started before culture results are available. Here a gram stain may help in the initial choice of an antibiotic.

TOPICAL AGENTS

Of the topical antibiotic and chemotherapeutic agents available, bacitracin, sulfacetamide sodium, neomycin, polymyxin, and chloramphenicol have been found to be highly effective.[2] Bacitracin primarily inhibits the growth of many gram-positive bacteria. It is also effective against certain gram-negative cocci, including the gonococcus. It is of no value in fungus infections. Similarly, sulfacetamide sodium has a greater antibacterial activity against gram-positive cocci than against gram-negative bacilli, although it, too, is considerably effective against gonococci. Neomycin exhibits a broader spectrum of antibacterial activity than either bacitracin or sulfacetamide. It is effective against a variety of gram-positive and gram-negative microorganisms, against acid-fast bacilli, and actinomycetes. In contrast, the spectrum for polymyxin is restricted to gram-negative bacteria, including, however, pseudomonas. Of all the drugs mentioned, chloramphenicol possesses the widest spectrum of all. Included are streptococci, staphylococci, and many gram-negative bacteria.

All but chloramphenicol derive their effectiveness from infrequent systemic usage. If resistant mutants develop, future serious disease caused by these strains will still respond to the more commonly used antibiotics. The index of drug allergy is low for these medications. Sensitization is less disadvantageous to the patient than is the intolerance to systemically used antibiotics such as penicillin, where the 5 per cent incidence of local allergy is a strong deterrent to its use.[3]

Chloramphenicol, the last of the drugs listed, is also highly satisfactory. In addition to being able to overcome most staphylococci, it has the ability to penetrate the cornea readily. This increases its value in various forms of keratitis and intraocular infections. The studies of Swan and White[4] are of interest in this regard. The physical properties of the vehicles in which a drug is administered, *i. e.*, whether they are predominantly fat solvent or water solvent, determine the ease with which the drug will enter the eye through the cornea. Compounds in water are retained in their respective vehicles and therefore enter the cornea slowly. Substances that are fat soluble penetrate the intact corneal epithelium more readily. Chloramphenicol falls into this latter group and, hence, has a high degree of penetrability.

Other drugs much used in topical ocular therapy are those constituting the group of local anesthetics. The ill effects that follow their usage are many. Foremost is the inhibition of corneal re-epithelization after topical application. Two processes are involved in the healing of the corneal epithelium: (1) cell migration to cover the injured area and (2) mitosis to reconstitute the normal number of epithelial cells. The migratory activity occurs first and is followed shortly afterward by cell division. Buschke, Friedenwald, and Fleishmann[5] first found that topical anesthetics had a deleterious effect on mitosis. This thesis has since been confirmed.[6,7] An additional hazard is the development of subepithelial corneal infiltrates. This occurs when pontocaine or an allied agent is used to alleviate the symptoms of a conjunctivitis.

As a result, this group of drugs, the most commonly used of which is Pontocaine Hydrochloride (brand of tetracaine hydrochloride), is contraindicated in corneal abrasions, corneal ulcers, keratitis, and after removal of a corneal foreign body. The physician is entitled to use a topical anesthetic only while working on the eye itself, that is, while removing a foreign body. Subsequent to the initial management, however, ocular discomfort should be controlled by the systemic administration of analgesics such as codeine and Demerol Hydrochloride (brand of meperidine hydrochloride).

Prophylactic use of antibiotics after minor eye injuries will significantly reduce the incidence of serious infection. When deprived of its epithelium, the cornea is most susceptible to bacterial invasion. As routine practice, therefore, antibiotics should be prescribed until the epithelial defect has healed. A tight eye patch helps to insure the process. This contrasts with conjunctivitis where patching is contraindicated. When infection is present, patching creates a culture medium in which bacteria multiply rapidly.

It also is important to dilate the pupil when the cornea is irritated. Irritation causes pupillary constriction. The pathway for this reflex is the ophthalmic branch of the fifth cranial nerve to the Gasserian ganglion and the fifth nucleus. Connecting fibers finally run to the sphincter by way of the posterior longitudinal bundle. Local reflex dilatation of the iris capillaries through an axon reflex also contributes to constriction. These vasodilator impulses, carried in the fifth nerve, have been designated as antidromic because they travel in an opposite direction from those the nerve usually carries. The use of anticholinergic drugs such as homatropine hydrobromide, 2 per cent solution, or scopolamine hydrobromide, 0.2 per cent solution, is effective in eliminating pupillary constriction.

Finally, some of the dangers associated with the use of steroid hormones in the eye must be considered. Topical steroid therapy has been employed for vernal, allergic, chemical, and even bac-

terial conjunctivitis when combined with the proper antibiotics. This therapy also can, in certain specific instances, be used in this manner for corneal disease. Unfortunately, many corneal diseases do not respond favorably to steroid hormones. The use of steroids in such conditions as corneal abrasion, corneal ulcer, epidemic keratoconjunctivitis, fungus infection, and herpes simplex keratitis aggravates the disease process.

Similarly, the innumerable combinations of antibiotics with cortisone or hydrocortisone are contraindicated in the aforementioned conditions.

Hogan, Thygeson, and Kimura[4] amply demonstrated that the various steroid agents only reduce inflammatory signs. If the specific antibiotic will overcome the infecting organism, the steroids will not be harmful. If the infection is caused by a virus or is the result of resistant bacteria, steroids may interfere with the natural resistance of the host and thus mitigate against recovery.

Inasmuch as the steroids are only anti-inflammatory and are not bactericidal or bacteriostatic in action, Leopold[2] suggested using antibiotics alone. It is estimated that approximately 90 per cent of the population has antibodies for the herpetic virus.[3] Similarly, it is well known that any break in the corneal epithelium, either from trauma or otherwise, favors the development of a herpes keratitis.[3] These two factors make the latter an ever-present threat and the practice of employing antibiotics without steroids a sound one.

SUMMARY

Some of the better topical antibiotic and chemotherapeutic agents have been discussed. The importance of frequent administration, as well as the advantages of drop instillation over ointment application have been considered.

Contraindications to the use of local anesthetics and steroid hormones were emphasized. The former impede re-epithelization of the cornea by inhibiting mitosis. The latter are to be avoided in all corneal abrasions, corneal ulcers, keratitis, fungus infections, where foreign bodies are present, and especially in any ocular condition where there is an element of doubt as to cause. A herpes simplex keratitis, which so frequently results from indiscreet steroid therapy, is an extremely serious ocular condition. It poses a formidable threat to vision and indeed to the eye itself.

REFERENCES

1. Adler, F. H.: *Physiology of the Eye.* C. V. Mosby Co., St. Louis, Mo., 1950.

2. Leopold, I. H.: Recent advances in ocular therapy. *New York J. Med.* 56: 2803-2812, Sept. 15, 1956.

3. Havener, W. H.: Topical antibiotics in eye disease. *Postgrad. Med.* 20: 525-527, Nov. 1956.

4. Swan, K. C., and White, N. G.: Corneal permeability; factors affecting penetration of drugs in cornea. *Am. J. Ophth.* 25: 1043-1058, Sept. 1942.

5. Buschke, W.; Friedenwald, J. S.; and Fleishmann, W.: Studies on mitotic activity of corneal epithelium: methods. Effects of colchicine, ether, cocaine, and ephedrin. *Bull. Johns Hopkins Hosp.* 73: 143-167, Sept. 1943.

6. Gundersen, T., and Liebman, S. D.: Effect of local anesthetics on regeneration of corneal epithelium. *Arch. Ophth.* 31: 29-33, Jan. 1944.

7. Friedenwald, J. S., and Buschke, W.: Influence of some experimental variables on epithelial movements in healing of corneal wounds. *J. Cell. & Comp. Physiol.* 23: 95-107, Apr. 1944.

8. Hogan, M. J.; Thygeson, P.; and Kimura, S. J.: Effects of prednisone and prednisolone in ocular inflammation. *Tr. Am. Acad. Ophth.* 59: 779-782, Nov.-Dec. 1955.

9. Sery, T. W.: Unpublished data.

"THIS MUST BE AVOIDED"

The times in which we are living are dangerous and uncertain. The question of whether our country will be engaged in fighting a "brush fire," a "hot war," or whether we will be faced indefinitely with a "cold war," is of course, unanswerable. It would appear however, that we are living in a period when for the best of our country, our profession, and for what we believe to be a desirable way of life, personal wishes and preferences will have to give way to what is considered by our leaders as necessary for the group as a whole. This is not the time to "figure the angles," as such a course may bring disrepute on ourselves and our profession. We as individuals and as members of a profession are under an increasingly critical survey by groups which would like nothing better than to bring our profession under restrictive and bureaucratic control. Anything we do which creates public suspicion of our aims, ideals, or mores provides ammunition for these critics. One of the most serious of criticisms which might be made against us as individuals or as a profession is that we now lack patriotism. This must be avoided.—Perrin H. Long: "The Doctors Draft" (editorial), *Resident Physician*, November 1958.

PLEURISY WITH EFFUSION

Report of 98 Cases

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IDIOPATHIC pleurisy with effusion is predominantly a disease of early adult life, and a high incidence is, therefore, to be expected in a military hospital population. The tuberculosis service of this hospital discharged 98 patients, admitted because of supposed idiopathic pleurisy, during the two-year period between 1 October 1955 and 30 September 1957. The relative frequency of the ailment is indicated by the fact that these patients constituted 10.3 per cent of all patients discharged during that period.

While pleurisy with effusion is neither unusual nor novel, it remains important in practice, especially in military practice,[1] and our experience with these patients is reported in the belief that it will be of some general interest. For convenience, the cases are herein divided into those classified at discharge as tuberculous pleurisy and those classified as nontuberculous.

TUBERCULOUS PLEURISY

Of the 79 patients considered to have tuberculous pleurisy, all males, 16 (20.1 per cent) were between the ages of 17 and 19; 42 (53.2 per cent), between 20 and 24; 10 (12.7 per cent), between 25 and 29 years; 10 (12.7 per cent), between 30 and 39; and 1 patient was more than 40 years of age.

Sixty-one (77.2 per cent) of the patients were Caucasoid, 15 (18.9 per cent) Negroid, 1 (1.3 per cent) was a Mongoloid, 1 (1.3 per cent) a Malayan, and 1 (1.3 per cent) an American Indian. This representation approximates that usual on the service.

Twenty-eight of the men were members of the U. S. Navy, 9 of the U. S. Marine Corps, 37 of the U. S. Air Force, and 5 of the U. S. Army, a distribution also in accord with that commonly found in our patients.

From U. S. Naval Hospital, St. Albans, N. Y. Presented on 9 May 1958 at a meeting of the New York Trudeau Society, Albany, N. Y.

Seventy of the patients were admitted to the sick list because of the symptoms of pleurisy, generally fever, prostration, stitch in the side, and dyspnea of acute onset, often associated with chills and cough. Five cases were detected by routinely made chest photofluorograms or roentgenograms, a finding consistent with the evidence of old pleurisy noted at times in the chest roentgenograms of patients who can recall no relevant history. Four patients developed pleural effusion while under treatment for unrelated ailments: one for "sciatica," another for acute diarrhea (possibly febrile), a third for a remote fracture, and a fourth for amebiasis. In this last case the possibility of amebic pleuritis was excluded by the identification of *Mycobacterium tuberculosis* in a culture of the pleural fluid.

Associated Findings. The right pleural cavity was involved in 36 (45.6 per cent) of the patients with tuberculous pleurisy, the left in 40 (50.5 per cent), and both cavities in 3 (3.9 per cent).

Roentgenograms of the chest revealed associated pulmonary lesions in 2 patients, right hilar lymphadenopathy in 1, calcified hilar lymph nodes in 2, and calcified mediastinal nodes in 1. One patient had scattered pulmonary calcifications and one a calcified primary complex. All of the patients with the calcifications named reacted to histoplasmin as well as to tuberculin.

Pericarditis, proved to be tuberculous by biopsy, was associated with bilateral pleural effusion in the case of the American Indian. Bacteriologically positive cervical lymphadenitis coexisted in another case, and in still another serial roentgenograms showed rapidly progressive scoliosis toward the affected side, thought to be the result of advancing fibrothorax.

Since the majority of the patients had been treated by one or more thoracenteses during the acute phases of their illnesses, and 16 had been placed on chemotherapy prior to their admission to our service, only 31 (39.4 per cent) had residual or re-forming pleural fluid after arrival, and some of these had so little fluid that thoracentesis appeared to be superfluous.

When asked to describe the fluid removed from their chests, with surprising regularity the patients likened it either to beer or to urine. When the fluids were examined, the two constant clinicopathologic findings were a high percentage of protein and a predominance of lymphocytes in blood cell counts. One specimen of fluid contained many eosinophils.

The results of bacteriologic examinations, made both before and after the patients arrived at our hospital, were extremely meager. In only 13 (16.5 per cent) of the 79 cases was tuberculosis proved bacteriologically. In two cases acid-fast bacilli were seen in smears of the pleural fluid, and in four other cases *Myco. tuberculosis* was identified by culture of the fluid. In one case the sputum was positive by smear, and in

another by culture, and in a third the gastric content was positive by culture. In the remaining four positive cases, the organism was recovered from tissue specimens; twice after decortication, once at pericardial biopsy, and once from a biopsied cervical lymph node.

The health records of Navy and Marine Corps patients offered some evidence as to the time lapse between photofluorographic negativity of the chests of these patients and the time of their clinical admissions with pleurisy. One patient developed pleurisy with effusion about one month after having been pronounced negative by this method of examination, and one had not been thus examined for 29 months. On the average, pleurisy in these patients occurred 8.4 months after reported normal photofluorograms. These figures emphasize the rapid development of the syndrome.

Immunologic Data. All of the patients were tested intradermally with tuberculin (PPD, 0.00002 or 0.0001 mg.; or old tuberculin, 1:100), coccidioidin (1:1000), and histoplasmin (1:1000). All reacted to tuberculin with one exception. The exception was a youth from whose pleural fluid *Myco. tuberculosis* was recovered in culture by an unquestionably reliable laboratory prior to his arrival at our hospital. In this case it was decided—we hope correctly—that the bacteriologic evidence must outweigh the immunologic.

Two patients (2.5 per cent) reacted to coccidioidin, one of whom had acid-fast bacilli in his sputum; and 13 (16.5 per cent) reacted to histoplasmin, three of whom on appropriate examination were found to harbor *Myco. tuberculosis*. The percentages of these patients reacting to coccidioidin and to histoplasmin were less than those usually encountered among our patients, of whom about 5 per cent react to the former and about 20 per cent to the latter antigen.[2]

Recruits of the U. S. Navy and Marine Corps have been tested with tuberculin (0.0001 mg of PPD) upon enlistment since 1949, and the result of the test is usually available in the person's health record. Six of the Navy enlisted men and Marines here considered entered the service prior to the institution of this program, and in two other cases the result of the test was not available. In 28 (96.6 per cent) of the remaining 29 cases, conversion of the patients' reactions to tuberculin from negative to positive, between the time of their enlistment and the time of their clinical admissions, was demonstrated. In 21 of these, conversion occurred within the first three years in the service. One of the patients "converted" his reaction after hospitalization.

One member of the U. S. Army, tuberculin-negative at the time of his admission, likewise became a reactor while under observation.

The phenomenon of conversion of the tuberculin reaction and the phenomenon of pleurisy with effusion thus coincided in 28 of the 29 instances in which both could concur in this material.

Treatment. The currently accepted treatment for tuberculous pleurisy consists of chemotherapy with streptomycin sulfate, isoniazid, and para-aminosalicylic acid in some combination for a minimum period of one year, together with more or less rest in bed. Sixteen of these patients already had been placed on some program of chemotherapy prior to admission to our hospital. Most of the remainder were given chemotherapy according to the Veterans Administration-Armed Forces protocols for the chemotherapy of tuberculosis.[3] There were no relapses during our observation of the patients.

The place of bed rest in the treatment of tuberculous pleurisy is a subject of debate at the present time. These patients were managed by a program aiming at 16 hours in bed each day for about four months prior to ambulation.

The desirability of draining off pleural effusions is likewise a moot question. Thoracentesis was performed in these patients as often as might be necessary to keep the affected pleural cavity reasonably "dry," in the hope of avoiding thick pleural peels and fibrothorax. The steroid hormones were not used, although their usefulness for this purpose is currently under investigation. In this connection, the usefulness of roentgenograms of a lateral view of the chest should be emphasized, because they often distinguish a massive pleuritis from a localized collection of fluid.

One patient had been subjected to pleural decortication prior to his arrival, and two were treated by this operation in our hospital—in the one case because of unresolved thick pleura and in the other because of progressive fibrothorax with resulting scoliosis.

Disposition. Thirty-one (39.2 per cent) of the patients were recommended for return to military duty after treatment, and one was transferred to another military hospital for humanitarian reasons, ultimately returning to duty. Forty-seven patients (59.5 per cent) were transferred to Veterans Administration hospitals.

Optimism as to prognosis in this disease is justified by the highly satisfactory treatment results recently reported by Schless, Harrison, and Wier[4] in a series of 250 similar cases observed for from one to four years.

NONTUBERCULOUS PLEURISY

During the same two-year period, 19 patients with some form of pleurisy, of essentially the same age and racial distribution, were discharged from the service with diagnoses other than tuberculous pleurisy. Eight of these were admitted with chest

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symptoms, while 11 were detected by routine roentgenograms. The effusion was discovered in two patients when they were examined for hernia, in a third patient when examined for anatomically remote trauma, and in a fourth for a recent, direct crushing injury to the thorax on the side of the effusion. In no case was *Myco. tuberculosis* discovered by any method of examination.

Twelve patients did not react to tuberculin, including 2 in whom the effusion was thought to be the result of trauma, 2 with empyema (*Klebsiella pneumoniae* was recovered from one of these), and 1 with hydropneumothorax following spontaneous pneumothorax. In 7 patients, one of whom was subjected to pleural biopsy, there was no apparent explanation for pleurisy.

Six of the patients tested reacted to tuberculin. Two of these displayed pleural caps only in roentgenograms, one had empyema due to *K. pneumoniae,* one a serosanguineous, sterile effusion following direct external trauma, and one a hydropneumothorax following misadventure during brachial block anesthesia. In one patient decortication was carried out with the finding of "granuloma," bacteriologically negative. In retrospect this patient should probably have been considered tuberculous.

One patient, found to have purulent empyema on admission, was transferred at once to the thoracic surgical service without tuberculin test.

All of these patients were returned to military duty after treatment.

Comment. While the classification of these cases into "tuberculous" and "nontuberculous" categories was arbitrary at times, we believe that the data regarding conversion of the tuberculin reaction in our Navy and Marine Corps patients show that the tuberculin skin test reaction alone in a young American is an excellent diagnostic criterion. The recently advocated pleural biopsy[4-7] must, of course, be taken into account in the future, and a study comparing tuberculin conversion with findings at pleural biopsy is in progress.

SUMMARY

Ninety-eight cases of known or supposed pleurisy with effusion were processed by a military tuberculosis service in a two-year period. Seventy-nine of these were classed as tuberculous, 19 as nontuberculous. Conversion of the tuberculin reaction from negative to positive occurred in 28 of the 29 Navy and Marine Corps patients considered to have tuberculous pleurisy, in whose cases data were available. The value of the tuberculin test as a diagnostic criterion in pleurisy is emphasized.

REFERENCES

1. Roper, W. H., and Waring, J. J.: Primary serofibrinous pleural effusion in military personnel. *Am. Rev. Tuberc.* 71: 616-634, May 1955.

2. Spencer, G. E., and Gray, J. A. C.: Problem of Histoplasmosis in military tuberculosis hospital. *Am. Rev. Tuberc.* 75: 833-835, May 1957.

3. Protocols for the chemotherapy of tuberculosis as revised following the 16th Veterans Administration-Armed Forces Conference in St. Louis, Mo., Feb. 11-14, 1957. In *Transactions of the 16th Conference on the Chemotherapy of Tuberculosis,* St. Louis, Mo., Feb. 11-14, 1957, by the Veterans Administration, and the Armed Forces with the cooperation of the National Tuberculosis Association. pp. 502-503.

4. Schless, J. M.; Harrison, H. N.; and Wier, J. A.: Role of thoracotomy in differential diagnosis of pleural effusions. In *Transactions of the 17th Conference on the Chemotherapy of Tuberculosis,* Memphis, Tenn., Feb. 3-6, 1958, by the Veterans Administration and the Armed Forces with the cooperation of the National Tuberculosis Association. pp. 163-170.

5. Stead, W. W.; Eichenholz, A.; and Stauss, H. K.: Operative and pathologic findings in 24 patients with syndrome of idiopathic pleurisy with effusion, presumably tuberculous. *Am. Rev. Tuberc.* 71: 473-502, Apr. 1955.

6. Hill, H. E.; Hensler, N. M.; and Breckler, I. A.: Pleural biopsy in diagnosis of effusions; results in 50 cases of pleural disease observed consecutively. *Am. Rev. Tuberc.* 78: 8-16, July 1958.

7. Donohoe, R. F.; Katz, S.; and Matthews, M. J.: Pleural biopsy as aid in etiologic diagnosis of pleural effusion; review of literature and report of 13 biopsies. *Ann. Int. Med.* 48: 344-362, Feb. 1958.

USE OF OBSTETRICAL FORCEPS

All obstetricians recognize the fact that the risk in forceps deliveries increases about in arithmetical progression with the height of the presenting part in the birth canal. The confusion exists with respect to what is meant by "head on the perineum" or "head at mid-pelvis." Many doctors think that this refers to the location of the scalp in the birth canal. Actually, an obstetrician is interested only in the location of the plane of greatest diameters of the presenting part in the pelvis. In a vertex presentation this plane of the presenting part is bounded by the biparietal and the suboccipitobregmatic diameters. The relationship between the plane and the scalp may vary within wide limits in labor due to molding or development of caput succedaneum or cephalhematoma. Failure to recognize this fact leads to many mistakes in determining the exact location of the plane of greatest diameters in the birth canal and consequent improper use of forceps.—W. B. H.: Attack on the Use of Forceps (editorial). *Pennsylvania Medical Journal,* October 1958.

BIBLIOGRAPHY OF SPACE MEDICINE

Prepared by CHARLES A. ROOS

This bibliography was published by the National Library of Medicine in June 1958 and is reprinted with the permission of Lieutenant Colonel Frank B. Rogers, MC, USA, director of the Library. Mr. Roos is the head of the documents section. It is the first published bibliography of space medicine, a new and intriguing biological field which is the natural extension and progression of the specialty of aviation medicine.

The compilation of 446 titles includes supplementary material that has appeared in the world literature through December 1958. Because a great number of the articles are from military sources, it is hoped that this bibliography will be of interest and value to many of our readers. It should be a welcome reference to those who were unable to obtain the editions published by the Library. —Editor

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GENERAL

1958

1. Aviation medicine on the threshold of space: a symposium. *J. Aviat. M.* 1958, 29: 485-539. Contents: CAMPBELL, P. A.: Achievements of the past year, pp. 485-492; SCHAEFER, H. J.: New knowledge of the extra-atmospheric radiation field, pp. 492-500; BEISCHER, D. E.: Potentialities and ramifications of life under extreme environmental conditions, pp. 500-503; GERATHEWOHL, S. J., and STALLINGS, H. D.: Experiments during weightlessness: a study of the oculoagravic illusion, pp. 504-516; BESON, E. E.: Design considerations of a balloon-borne pressurized capsule for high altitude bail out study, pp. 516-525; HAWKINS, W. R.: The feasibility of recycling human urine for utilization in a closed ecological system, pp. 525-535; CLARK, C. C.: A closed food cycle atomic conservation for space flight, pp. 535-539.

2. *Behind the sputniks:* a survey of Soviet space science. Washington, D. C., Public Affairs press, 1958. vi, 380 pp. F. J. Krieger [editor]. Especially: Part III, Biological factors. ISAKOV, P. K.: Problems of weightlessness, pp. 126-133; BALAKHOVSKII, I. S., and MALKIN, V. B.: Biological problems of interplanetary flights, pp. 134-145; ROZENBLAT, V. V.: Before flight into the cosmos pp. 146-155; POKROVSKII, A. V.: Vital activity of animals during rocket flights into the upper atmosphere, pp. 156-163. The above papers are listed separately and more completely in this bibliography as items 297, 92, 106, and 105, respectively.

3. BERRY, C. A.: The environment of space in human flight. *Aeronaut. Eng. Rev.*, 1958, 17: 35-39 (No. 3, Mar.) Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 41).

4. BINAGHI, A. Introduccion al estudio del comportamiento de la fisiologia humana en astronautica. [Introduction to the study of the behavior of human physiology in astronautics]. *Sem. med., B. Air.* 1958, 112: 979-992.

5. [Brief report on biological aspects of Sputnik II] *Naturwissenschaft. rundschau* 1958, 11: 21.

6. British Interplanetary Society. Symposium on space medicine, London, 16th - 17th October 1958. [Papers] [London, 1958] The National Library of Medicine has the following papers: BILLINGHAM, J.: Heat exchange between man and his environment on the surface of the moon, 7 pp.; BILLINGHAM, J.: Man's thermal environment during interplanetary travel, 7 pp.; HANSON, S.W.F.: Some problems of space feeding (abstract), 1 p.; BJURSTEDT, H.: Effects of prolonged exposure to positive g loadings on the pulmonary gas exchange (abstract), 2 pp.; CLEMEDSON, C. J.: Some blast studies with application to explosive decompression, 5 pp.; CUNNINGHAM, C.: The effects of sensory impoverishment, confinement and sleep deprivation, 5 pp.; GUIGNARD, J. C.: The physiological effects of transient mechanical forces: a review

of their relevance to astronautics. [5] pp.; HOOVER, G. W.: The man-machine system in space vehicles, 10 pp., 14 figs.; JACKSON, K. F.: Impairment of human performance in control, 4 pp.; LANSBERG, M. P.: Some consequences of weightlessness and artificial weight, 4 pp.; PARKES, A. S., and SMITH, A. U.: Space transport of life in the dried or frozen state, 3 pp.

7. British Interplanetary Society Symposium on space medicine. *Brit. M. J.* 1958, 2: 1035-1037. Brief review of selected papers.

8. BUGROV, B. G., and others: Issledovaniia zhiznedeiatel'nosti zhivotnykh pri poletakh v negermeticheskoi kabine raket do vysoty 110 km. [Studies on vital functions in animals during flight in non-hermetic cabins in rockets up to 110 km.] In: Preliminary results of scientific researches on the first Soviet artificial earth satellites and rockets. Articles. XIth. Section of IGY program (rockets and satellites) No. 1. Moscow, Academy of Sciences, 1958. pp. 130-149. In Russian with brief summary in English.

9. CAMPBELL, P. A.: The utilization of a satellite laboratory for life science studies. 51 pp., [1958] Paper presented at the Second Annual AFOSR Astronautics Symposium, Denver, Colorado, April 29, 1958.

10. CHAMPLIN, G. A.: The challenge of man's entry into space. *Mil. M.*, 1958, 123: 422-427.

11. CLEMEDSON, C. J.: Med jordiska och Kosmiska mått; några rymdfartsmedicinska problem [Earthly and cosmic standards of measurement; problems of space medicine] *Sven. läk. tidn.*, 1958, 55: 293-320. General review of space medicine problems.

12. COOLEY, D. G.: Man in space. *Today's Health* 1958, 36: 31-37. Mainly photographs.

12a. DEBIJADI, R., and WESLEY-TANASKOVIC, I.: Covek u kosmosu; uvod u kosmicku medicinu. [Man in the space; introduction to space medicine] *Voj. san. pregl., Beogr.* 1958, 15: 556-557.

13. FENN, W. O.: The challenge of space medicine. *A. I. B. S. Bulletin* 1958, 8: 15 (No. 2, Ap.).

14. Flight to the moon: the complete story, in pictures, of DONALD FARRELL'S week long simulated space voyage at the USAF School of Aviation Medicine. *Astronautics* 1958, 3: 32-34 (No. 4, Ap.).

15. GALKIN, A. M., and others: Issledovaniia zhiznedeiatel'nosti zhivotnykh pri poletakh v germeticheskikh kabinakh raket do vysoty 212 km. [Studies on vital functions of animals during flights in hermetic cabins of rockets up to 212 km.] In: Preliminary results of scientific researches on the first Soviet artificial earth satellites and rockets. Articles. XIth. Section of IGY program (rockets and satellites) No. 1. Moscow, Academy of Sciences, 1958. pp. 112-129. In Russian with brief summary in English.

16. GRANDPIERRE, R., and BOUVEROT, P.: Incidences physio-pathologiques de l'emploi des fusées comme moyen de transport

[Physiopathological factors in the use of rockets as a means of transportation]. *Concours méd.* 1958, 80: 265-267, 269-270.

17. GUIGNARD, J. C.: "Spaceman overboard." *Spaceflight* 1958, 1: 282-287. Especially section on vision.

18. HAWKES, R.: Weightlessness crucial spaceman factor. *Aviation Week* 1958, 68: 50-51, 53, 55, 57 (No. 5, Feb. 3). Space medicine research at Aero Medical Field Laboratory, Holloman AFB described.

19. HAWTHORNE, R., and DeBIASI, V.: Advancing the "vertical frontier." *Space-aeronautics* 1958, 30: 22-23, 193. Notes on selected papers presented at the Second international symposium on physics and medicine of the upper atmosphere and space, School of Aviation Medicine, Randolph AFB, Texas, November 1958. Complete listing of papers presented, pp. 23, 193. For additional notes on the Symposium see: *Sci. News Letter* 1958, 74: 326.

20. HECHT, F. (editor): VIIIth international astronautical congress, Barcelona 1957. Vienna, Springer, 1958. vii, 607 pp. Especially: BECKH, H. J. VON. Multidirectional G-protection in space vehicles, pp. 37-46; BUN, T. P., and PEREIRA, F. A.: "Biospheric Index," a contribution to the problem of determination of the existence of extrasolar planetary biospheres, pp. 63; KAULBERSZ, J., and others.: Alterations in some blood reactions and in the white cell count during the total eclipse of the sun in Poland 1954, pp. 236-240; SIMONS, D. G.: Observations from the Manhigh II balloon capsule at 30 kilometers, pp. 388-394; SLATER, A. E.: The probability of intelligent life evolving on a planet, pp. 395-402; WINZEN, O. C.: Ten years of plastic balloons, pp. 436-459; WINZEN, O. C.: The Manhigh II balloon operation, pp. 460-463; GERATHEWOHL, S. J., and others: Producing the weightless state in jet aircraft, pp. 533-542. Von Beckh's paper was also published: *J. Brit. Interpl. Soc.* 1958, 16: 525-533; and (in Spanish): *Astronautica* (Barcelona) 1958, 5: 163-168. Gerathewohl's paper was published elsewhere as indicated by entry in item 284 of this bibliography.

21. Homo spaciens. *Physician's Bulletin* 1958, 23: 67-69.

22. ISAKOV, P. K.: Life in Sputnik; a Russian biologist examines problems involved in keeping a living organism alive in space and reveals Soviet approaches. *Astronautics* 1958, 3: 38-39, 49-50 (Fe.).

23. ISAKOV, P. K., and MALKIN, V. B.: "Voprosy meditsiny pri mezhplanetnykh poletakh" [Medical problems in interplanetary flights] *Med. rabot.* 1958, No. 7, 24 Ja., p. 4. Review of a volume of 23 translations into Russian from the foreign literature. Articles translated are by Armstrong, Haber, Strughold, Von Beckh, Gaspa, Ballinger, Schaeffer, etc.

24. KONECCI, E. B.: Human factors in space flight. *Aero/Space Engineering* 1958, 17: 34-40 (Je.).

25. KOUSNETZOV, A. G.: Some results of biological experiments on rockets and Sputnik II. *J. Aviat. M.* 1958, 29: 781-784.

26. LAMBERTSEN, C. L.: From submarines to satellites. *Circul. Res.* N.Y. 1958, 6: 405-409.

27. LEAVITT W.: Blueprint for tomorrow's space crews. *Air Force* 1958, 41: 42-46, 49 (No. 5, My.). Research at various U.S. Air Force installations described.

28. LEAVITT, W.: Man in space. *Air Force* 1958, 41: 109-117, 120-123 (No. 3, Ap.).

29. MALKIN, V.: Mediko-biologicheskie issledovaniia na raketakh-predvarietel'nyie itogi geofizicheskogo goda [Medical and biological research by means of rockets—preliminary findings of the IGY. *Sovetskaia Aviatsiia* 9 Se. 1958, p. 2.

30. Man's scientific role in space debated. *Space Tech.* 1958, 1: 47-50 (No. 3, Jy.). Summary of 2nd annual AFOSR astronautics symposium. See especially remarks of PAUL CAMPBELL on man vs. instrumentation. Reprinted in part: *J. Aviat. M.* 1958, 29: 625.

31. MOWBRAY, L.: Scaphandre pour le vide et demonstration d'impesanteur. [Vacuum suit and demonstration of weightlessness.] *Nature, Paris,* 1958, pp. 41-46 (Feb.).

32. NAHAS, G. G.: Biologie et médecine dans l'espace [Biology and medicine in space. *Problèmes,* Paris, 1958, No. 53, Se.-Oct. pp. 60, 62, 64, 67.

33. PARTEL, G.: L'Astronautica. Rivista Aeronautica (Rome) 1958, 34: 491-529. Animali nello spazio [Animals in space] pp. 522-525; L'uomo nello spazio [Man in space] pp. 525-526; Problemi biologici della navigazione interplanetaria [Biological problems of interplanetary flight] pp. 527-529.

34. PHOEBUS, C. P.: Accommodating the spaceman. U.S. Office of Naval Research. *Research Reviews* 1958, pp. 6-12 (Je.).

35. Research at the School of Aviation Medicine, USAF. *U.S. Air Force M. Serv. Dig.* 1958, 9: 11-16 (No. 3, My.-Je.). *Space flight,* pp. 15-16.

36. SHTERNFEL'D, A.: Artificial satellites (Iskusstvennyye sputniki). Translation prepared by Technical Documents Liaison Office, Wright-Patterson AFB, Ohio. [2d revised and extended edition] 1958 viii, 424 p. Originally published by State Publishing House of Technical-Theoretical Literature, Moscow, 1958. Especially: Man in cosmic space, pp. 198-228 (general discussion of space medicine problems) and pp. 249-254 (sealed cabin ecology). Available from Office of Technical Services, U.S. Dept. of Commerce. Price $6. (PB14135IT).

37. SILLEVAERTS, C.: Les satellites artificiels. Conquête de l'air 1958, 54: 7-11, (No. 4, Ap.). Biological aspects of Sputnik II with remarks on some prior space medical research.

38. SIMONS, D. G.: Observations made during Manhigh II flight. *Jet Prop.* 1958, 28: 521-522.

39. SIMONS, D. G.: Pilot reactions during "Manhigh II" balloon flight. *J. Aviat. M.* 1958, 29: 1-14.

40. SIMONS, D. G.: State of the art [of astronautics] 1958. Human factors. *Astronautics* 1958, 3: 58-59, 77 (No. 11, Nov.).

41. Soviet writing on earth satellites and space travel. New York, Citadel [c. 1958] 253 pp. Especially: Man in outer space [by ARI STERNFELD] pp. 40-60; Life in Sputnik, by P. ISAKOV, pp. 180-188 [First published: Komsomolskaya Pravda November 5, 1957].

42. Soviets report to IGY on satellite dog. *Aviat. Week* 1958, 69: 51, 53. Account based on paper by VLADIMIR YAZDOVSKY delivered at IGY congress in Moscow. Also: *Space Tech.* 1958, 1: 30 (No. 4, Oct.).

43. Sovetskie sputniki zemli [Soviet earth satellites] *Med. rabot.* 1958, 21: p. 1 (No. 80, 7 Oct.).

44. Spaceships and submarine medicine linked at International symposium. *Scope Weekly* 1958, 3: 1, 4 (No. 39, Sep. 24). Brief report of paper by DEAN BURK at International Symposium on submarine and space medicine held at the U.S. Naval Submarine Base, New London, Conn.

44a. STRUGHOLD, H.: Space medicine [editorial]. *New Physician* 1958, 7: 9-10 (No. 4, Apr.).

45. STRUGHOLD, H.: Staying alive in space. *Air Force* 1958, 41: 84-87 (No. 4, Apr.).

46. TAYLOR, E. R.: Physical and physiological data for bioastronautics. Randolph AFB, Texas, USAF School of Aviation Medicine, March 18, 1958. 149 pp.

47. Ten years of space medicine [editorial]. *J. A. M. A.* 1958, 168: 2024.

48. U. S. Air Force Missile Development Center, Holloman Air Force Base, New Mexico. Office of Information Services. Historical Branch. The beginnings of research in space biology at the Air Force Missile Development Center, Holloman Air Force Base, New Mexico, 1946-1952. [by DAVID BUSHNELL] The Center, [1958] iv, 28 l.

49. U.S. Air Force Missile Development Center, Holloman Air Force Base, New Mexico. Office of Information Services. Historical Branch. Major achievements in space biology at the Air Force Missile Development Center, Holloman Air Force Base, New Mexico, 1953-1957 [by DAVID BUSHNELL. The Center [1958] iv, 61 l. Important technological developments, pp. 2-7; Achievements in cosmic radiation studies, pp. 7-24; Project Man-High, pp. 24-44.

50. U. S. Air Force. School of Aviation Medicine, Randolph AFB, Texas: *Epitome of space medicine.* Randolph AFB, The School [1958] various paging. A collection of previously published journal articles and government reports numbered 1-41. The papers with their original source of publication and reference to their location in the *Epitome* (as item 1, etc.) are individually listed throughout this bibliography in accordance with their subject matter, chronology, etc.

50a. U. S. Congress. House. Select Committee on Astronautics and Space Exploration: *Hearings before the Select Committee on Astronautics and Space Exploration,* Eighty-Fifth Congress, Second session, on H. R. 11881. Washington, U. S. Govt. Print. Off., 1958. vii, 1542 pp. Especially: Statements by H. STRUGHOLD and J. P. STAPP, pp. 1215-1235; and additional material submitted by Dr. STRUGHOLD, pp. 1236-1260. The additional material consists of papers listed as items 108, 86 (final paper), 172 and 109, respectively, of this bibliography, together with: Spatiography (astronautical aspect) by H. STRUGHOLD (pp. 1256-1258); and Space medicine and astrobiology (report to be submitted to House Select Committee on Astronautics and Space Exploration) (pp. 1258-1260).

51. Vistas in astronautics: Proceedings of the first annual AFOSR Astronautics symposium. New York, Pergamon, 1958. xxi, 330 pp. Editors: ALPERIN, M.; STERN, M.; and WOOSTER, H. Especially: Part 6. Human factors. STRUGHOLD, H.: Introduction, pp. 281-284; CAMPBELL, P.: Human logistics from the viewpoint of space travel, pp. 285-287; WHITE, S.: The problems of maintaining man at extreme altitude, pp. 288-290; SCHAEFER, H. J.: Appraisal of cosmic ray hazards in extra-atmospheric flight, pp. 291-297; SIMONS, D. G.: Areas of current space medical research, pp. 299-303; HAUTY, G. T., and PAYNE, R. B.: Fatigue, confinement and proficiency decrement, pp. 304-309.

52. WESLEY-TANASKOVIĆ, I.: Fiziologija i astronautika; medicinski problemi u vezi s putovanjom coveka u vasionu [Physiology and astro-navigation; medical problems related to the human venture into space] *Med. glasn.* 1958, 12: 231-232.

53. WINZEN, O. C., and PARKS, D. P.: Operation Manhigh II. *Jet Prop.* 1958, 28: 523-532.

1957

54. ALEKSANDROV, A.: Chelovek i kosmos [man and cosmos] *Med. rabot.* 1957, No. 105, 31 Dec., p. 3. English translation: U.S. Central Intelligence Agency. Foreign Documents Division. Scientific Information report No. 1, 27 Feb. 1958, pp. 83-85.

55. Associazione Italiana Razzi. Proceedings of the VIIth International Astronautical Congress, Rome, 17-22 Sept. 1956. xxvi, 927 pp. Rome, 1956 [ie. 1957] Especially: STRUGHOLD, H.: The ecosphere in the solar planetary system (Helio-ecosphere), pp. 277-288; GERATHEWOHL, S. J.: Personal experiences during short periods of weightlessness reported by sixteen subjects, pp. 313-334; SIMONS, D. G.: Biological effects of primary cosmic radiation, pp. 381-400; LOMONACO, T., and others: Comportamento della coordinazione motoria in soggetti sottoposti a valori de accelerazione varianti da 3 a O g, pp. 825-839. The above papers have been published elsewhere as indicated by entries 426, 296, 332 of this bibliography.

56. Astronautics symposium. San Diego, Calif., Feb. 18-20, 1957. Summary Session. 55 pp. (Air Force Office of Scientific Research. AFOSR-TR-57-14) Especially: Human factors panel, pp. 42-51. A summary of item 51 of this bibliography.

57. BENSON, O. O., JR.: Progress in space medicine. *Missiles and Rockets* 1957, 2: 108, 111, 112.

58. BENSON, O. O., JR. Rocket era medical research nears "theory" end; trail now leads to active space flight experiments. *Army, Navy, Air Force J.* 1957, 95: 1, 11, 21 (12 Oct.).

59. CALDER, N.: Hazards to life in space. *New Scientist* 1957, 2: 19-20 (No. 51, 7 Nov.).

60. CAMPBELL, P. A.: Human parameters of space flight. *U.S. Air Force M. Serv. Dig.* 1958, 9: 2-10 (No. 3, My.-Je.).

61. CHRISTIAN, G. L.: Scientists disagree on man's space role. *Aviation Week* 1957, 67: 61, 64 (No. 24, Dec. 16). Report on the National symposium on human factors in systems engineering, Philadelphia, 1957. Also: *Missile Eng.* 1958, 2: 38-39 (No. 2, Ja.). Sleep vs. awakeness for prolonged flights.

62. Congrès international des fusées et engins guidés [International Congress of rockets and guided missiles. *Méd. aéronaut.* 1957, 12: 83-88. Summary of medical papers.

63. DANILIN, B. S.: Vtorzhenie v Kosmos [Invasion of the cosmos] Nauka i. zhizn' 1957, No. 12, p. 4-8. Translated into English in *Soviet Bloc International Geophysical Year Information* (13), March 4, 1958, pp. 2-10.

64. Design for living in outer space—man and dog. *Product Eng.* 1957, 28: 24-25 (No. 22, Dec. 2).

65. [DOBRONRAVOV, V.] [On the way to the cosmos] Abstracted and translated as: Soviet Scientist discusses human factor in space. In: *Soviet Bloc International Geophysical Year Information* (12) p. 4-7. First published: Moscow, *Kryl'ya Rodiny*, No. 6, Je. 1957, p. 20-22.

66. FAUST, H.: Der Mensch im Weltenraum [Man in space] *Naturwissenschaft. rundschau* 1957, 10: 270.

67. GUSTAVSON, J.: The possibility of interstellar flight. *Jet Prop.* 1957, 27: 69-70. Italian translation: *Riv. Aeronaut.* 1957, 33: 632-637. Author considers various means of inducing suspended animation.

68. HENRY, J. P., and others: Human factors research and development program for a manned satellite. III, 4 (U.S. Air Research and Development Command. Technical Report 57-160, October 1957).

69. HERSEY, I.: Dog in space. *Astronautics* 1957, 2: 30-31, 84, (No. 5, Dec.). Mainly engineering.

70. HOOVER, G. W.: Human engineering for space vehicles... *Missiles and Rockets* 1957, 2: 93-95.

71. KAHN, A.: Human factors in space flight. *Missiles and Rockets* 1957, 2: 81, 83-84.

72. LEY, W.: *Rockets, missiles, and space travel.* Revised and enlarged edition. New York, Viking, 1957. XV, 528 pp.

73. MALKIN, V.: Science and technology. On the road to interplanetary flights. In: U.S. Central Intelligence Agency. Foreign Documents Division. Scientific information report, number 1, 27 February 1958, pp. 87-88. First published: *Sovetskaya Aviatsiya,* 3 Nov. 1957, p. 4.

74. Man in space. *Brit. M. J.* 1957, 2: 1041-1042.

75. MASAMITSU, O.: Space medicine in the United States of America. *Japanese Safety Forces M. J.* 1957, 4: 12-18 (No. 2, Fe.). In Japanese.

76. MAYO, A. M.: The human factor in rocket and missile control. *Méd. aéronaut.* 1957, 12: 175-179. French translation of paper presented at the International congress on rockets and guided missiles, Paris, 3-9 Dec. 1956.

77. OGLE, D. C.: Address by Major General Dan C. Ogle, Surgeon General USAF at Symposium of Southern research institute, 16 May 1957 [on space medicine] *U.S. Air Force Medical Service Dig.* 1957, 8: 2-8 (No. 9, Se.). Reprinted as: Man in a space vehicle. *U.S. Armed Forces M. J.* 1957, 8: 1561-1570.

78. ORDWAY, F. I., III.: Investigación geofisica y biológica a altitudes extremas. Segunda parte. Investigacion biologica: supervivencia del hombre en el espacio. [Geophysical and biological investigation at extreme altitudes. Second part. Biological investigation; survival of man in space.] *Revista Asoc. Argentina Interplanetaria* 1957, 4: 1-23 (Nos. 16-17, Jy.-Dec.). Bibliography pp. 17-21.

79. QUINNELL, R. K.: The Human Component in extraterrestrial flight. *Canad. Serv. M. J.* 1957, 13: 245-258.

80. SCHMIDT, I.: Visibility of artificial satellites of the planet earth. *J. Aviat. M.* 1957, 28: 435-446. In German: *Weltraumfahrt* 1957, 8: 104-107.

81. SLATER, A. E.: Medical and biological problems. In: BATES, D. R. (editor): *Space research and exploration.* London, Eyre, 1957. p. 165-181.

82. SLATER, A. E.: Technical sessions at the Rome Congress. *J. Brit. Interpl. Soc.* 1957, 16: 22-47. Space medicine, pp. 43-47.

83. Space dogs get hero treatment in Soviet press. *Astronautics* 1957, 2: 56 (No. 2, Sept.).

84. *The space encyclopedia:* a guide to astronomy and space research. London, Artemis, 1957. BIZONY, M. T., general editor. Especially: STRUGHOLD, H.: Space medicine, pp. 229-234.

85. Space medicine. *MD* 1957, 1: 27-33 (Dec.).

86. Space travel: a symposium. *J. Aviat. M.* 1957, 28: 479-512. Contents: CAMPBELL, P. A.: Introduction, pp. 479-480; DANNENBERG, K.: The propulsion engineer's views, pp. 481-484; ROBERTS, W. O.: The astronomer's views, pp. 484-487; HABER, H.: The astrophysicist's views, pp. 487-492; CROSSFIELD, A. S.: A test pilot's viewpoint, pp. 492-495; HOOVER, G. W.: Instrumentation for space flight, pp. 495-498; MAYO, A. M.: Some survival aspects of space travel, pp. 498-503; HAGEN, J. P.: The Vanguard project, pp. 503-507; STRUGHOLD, H.: The possibilities of an inhabitable extraterrestrial environment reachable from the earth, pp. 507-512.

87. STAPP, J. P.: The first space man. *Astronautics* 1957, 2: 30-31, 82-83 (No. 4, Nov.). On the balloon flight of D. G. SIMONS to 102,000 feet.

88. SWEENEY, R.: Studies probe man's function in space. *Aviation Week* 1957, 67: 45-47, 49. (No. 26, Dec. 30). Work of Southern California contractors described.

89. Tsennyi vklad v osvoenie mezhplanentnykh poletov. [A valuable contribution to the mastering of interplanetary flight.] *Med. rabot.* 1957, No. 93, p. 4. (Nov. 19).

90. VAN LIERE, E. J.: Space medicine. *West Virginia M. J.* 1957, 53: 297-301.

1956

91. Abstracts of scientific papers to be presented at Association's 1956 meeting in Chicago. *J. Aviat. M.* 1956, 27: 156-193. Space medicine 157-159.

92. BALAKHOVSKII, I. S., and MALKIN, V. B.: Biological problems of interplanetary flights. In: KRIEGER, F. J.: *A casebook on Soviet astronautics.* Part II. Santa Monica, Calif., Rand [1957] pp. 81-96. (USAF project Rand. Research memorandum RM-1922, 21 June 1957). First published in: Priroda, 1956, 45: 15-21 (No. 8, Aug.). German translation: *Naturwissenschaft. rundschau* 1957, 10: 173-177.

93. BERGHAUST, E., and BELLER, W.: *Satellite.* New York, Hanover, [c 1956] Especially: Mice and monkeys, then men, pp. 155-166; Survival in space, pp. 181-195.

94. CANNEY, H. E., Jr., and ORDWAY, F. I., III.: The uses of artificial satellite vehicles. *Astronautica Acta* 1956, 2: 147-174. Biology and medicine and the space satellite, pp. 162-166.

95. DAVIS, W. O.: Fundamental basis of space flight. *J. Astronautics* 1956, 3: 9-10, 25. Considers medical problems.

96. EHRICKE, K. A.: Astronautical and space-medical research with automatic satellites. In: *Earth satellites as research vehicles.* Proceedings of the symposium held April 18, 1956 at the Franklin Institute in Philadelphia, pp. 25-68. (*Journal of the Franklin Institute,* monograph No. 2, June 1956) Article is primarily nonmedical.

97. [GAUME, J. G., and ROTH, E. M.] To Mars and back how soon? *Air Force* 1956, 39: 47-52. Answers to questions on general problems of space medicine, asked by E. M. MILLER and H. DUNCAN.

98. HITCHCOCK, F. A.: Present status of space medicine. *J. Astronautics* 1956, 3: 41-42, 51-52 (No. 2).

99. HITCHCOCK, F. A.: Some considerations in regard to the physiology of space flight. *Astronautica Acta* 1956, 2: 20-24.

100. MALLAN, L.: *Secrets of space flight.* New York, Arco, [c 1956] 144 pp.

101. MAYO, A. M.: Environmental considerations of space travel from the engineering viewpoint. *J. Aviat. M.* 1956, 27: 379-389. Also: *Interavia* 1956, 11: 435-438.

102. MILLER, E. M. and DUNCAN, H.: Window into space. *Air Force* 1956, 39: 43-46 (No. 12, Dec.). Research at the School of Aviation Medicine, Randolph Field, Texas, described.

103. MÜLLER, B.: Flugmedizin; Kompendium der Luftfahrtmedizin. [Flight medicine; compendium of aviation medicine] 236 pp. Düsseldorf, Droste, 1956. (Nordrhein-Westfalen. Ministerium für Wirtschaft und Verkehr. Verkehrswissenschaftliche Veröffentlichungen. Heft 34). Especially chapter 9: Weltraumflug [Space flight] pp. 209-222.

104. NIELKE, H.: *Der Weg ins All.* Berlin, Neues Leben, 1956. Mensch und Weltraumflug [Man and space flight] pp. 194-213.

105. POKROVSKI, A. V.: Study of the vital activity of animals during rocket flight into the upper atmosphere. In: KRIEGER, F. J.: *A casebook on Soviet astronautics.* Part II. Santa Monica, Calif., Rand [1957] pp. 163-172. (USAF project Rand. Research memorandum RM-1922, 21 June 1957). Report presented at the Congrès internationale des fusées et engins guidés, Paris, Dec. 3-8, 1956. In French: *Fusées et recherche aéronautique* 1958, 3: 5-7. English summary: *Jet Prop.* 1957, 27: 186-188. Dogs rocketed to 100 Km. and recovered.

106. ROZENBLAT, V. V.: Before flight into the cosmos. In: KRIEGER, F. J.: *A casebook on Soviet astronautics.* Part II. Santa Monica, Calif., Rand [1957] pp. 131-144. (USAF project Rand. Research memorandum RM-1922, 21 June 1957). First published in: *Nauka i Zhizn'* 1956, 23: 25-28 (No. 11, Nov.).

107. STEWART, W. K.: High altitude and space travel. *J. R. Soc. Promotion Health,* London 1956, 76: 423-424.

108. STRUGHOLD, H.: Medical problems involved on orbital space flight. *Jet Propulsion* 1956, 26: 745-748, 756, 788. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 32).

109. STRUGHOLD, H.: A simple classification of the present and future stages of manned flight. *J. Aviat. M.* 1956, 27: 328-331. Also

in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 31).

1955

110. BECKH, H. J. A., VON.: *Fisiologia del vuelo* [Physiology of flight]. 147 pp. Buenos Aires, Alfa, 1955. Especially: La gravitación cero [zero g], pp. 99-110; Aspectos fisiologicos del vuelo espacial [Physiological aspects of space flight], pp. 111-123.

111. BENFORD, R. J.: *Doctors in the sky:* the story of the Aero Medical Association. Springfield, Thomas [c 1955]. Especially: Establishment of] Space medicine branch, pp. 228-232.

112. BRADSHAW, P.: Problems of the manned rocket. *J. Camb. Univ. Interpl. Soc.* 1955, 1: 27-29 (Je.).

113. CAMPBELL, P. A.: Aeromedical and biological considerations of flight above the atmosphere. *J. Brit. Interpl. Soc.* 1955, 14: 1-12. Also in: CARTER, L. J. (editor): *Realities of space travel.* London, Putnam 1957. pp. 251-265.

114. FISHER, A. C.: Aviation medicine on the threshold of space. *Nat. Geog. Mag.* 1955, 108: 241-278. Review of article: *J. Aviat. M.* 1955, 26: 355.

115. HENRY, J. P.: Physiological laboratories in rockets. *Astronautics* 1955, 2: 22-26. Same title: *Bull. Med. Res.* 1956, 10: 2-4 (No. 3).

116. JONGBLOED, J.: Ruimtevaartgeneeskunde [Physiological aspects of space travel.] Aeromedica acta 1955, 4: 11-17.

117. KENTOSH, M.: The human body in space. *Michigan Technic* 1955, 73: 14-15, 24, 36, 38, 56 (No. 7, Ap.).

118. MALLAN, L.: *Men, rockets and space rats.* N.Y., Messner 1955. 335 pp.

119. Man in space. *Lancet* 1955, 1: 601.

120. ROTH, E. M.: Medical aspects of travel in outer space. *Harvard Med. Alumni Bull.* 1955, 29: 10-13 (Jy. No. 4).

121. SLATER, A. E.: Medical and meteorological astronautics. *Aeroplane,* London 1955, 89: 276. Brief discussion of medical and meteorological papers presented at the 6th annual congress of the IAS, Copenhagen, Aug. 1-6, 1955.

122. STRUGHOLD, H.: The medical problems of space flight. *Internat. Record M.* 1955, 168: 570-575.

123. STRUGHOLD, H.: Space equivalent conditions within the earth's atmosphere: physiological aspects. *Astronautica Acta* 1955, 1: 32-40. Same title in German: *Weltraumfahrt* 1955, 6: 2-5.

124. I viaggi interplanetari dal punto di vista medico [Interplanetary travel from the medical point of view]. *Minerva med. Tor.* 1955, 46: 506.

1954

125. Aeromedical research implications of space flight. In U.S. Department of the Air Force: *Flight surgeon's manual,* pp. 471-473. (Air Force manual 160-5, Oct. 1954).

126. Award for research in space flight. *J. A. M. A.* 1954, 156: 275. The Oberth Medal to Dr. STRUGHOLD. See also: *J. Aviat. M.* 1954, 25: 439.

127. HABER, H.: Man and machine between atmosphere and space. *Aeronaut. Eng. Rev.* 1954, 13: 56-62 (Nov.).

128. HABER, H.: The physical environment of the flyer. [Randolph Field, Texas] USAF School of Aviation Medicine, 1954. The aeropause, pp. 135-155; Bibliography, pp. 157-166.

129. HENRY, J. P.: Flight above 50,000 feet: a problem in control of the environment. *Astronautics* 1954, 1: 12-19 (No. 1).

130. JANJIC, M.: Medical problems of space flight. *Vasiona* 1954, 2: 7-10 (No. 1, Ja.-Mar.). In Serbo-Croatian.

131. KENDRICKS, E. J., and others.: Medical problems of space flight. 21 pp. In USAF School of Aviation Medicine, Randolph AFB, Texas: *Epitome of space medicine* (Item 9). Reprinted from the Winter 1954 issue of *Instructors Journal,* a publication of the Air Training Command. Contents: KENDRICKS, E. J.: Men are now flying in space, pp. 1-3; STRUGHOLD, H.: Living room in space, pp. 3-10; Characteristics of the earth's atmosphere, pp. 10-13; HABER, H.: From high-altitude flight to space flight, pp. 13-16; GERATHEWOHL, S. J.: The peculiar state of weightlessness, pp. 16-21.

132. OBERTH, H.: *Menschen im Weltraum.* 256 pp. Düsseldorf, Econ, [1954] English translation: Man into space. New York, Harper, 1957.

133. ORDWAY, F. I., III, and CANNEY, H. E., Jr.: The respectability of astronautics as reflected by recent developments in the United States. In HECHT, F. (editor): *Bericht über den V. Internationalen astronautischen Kongress,* Innsbruck, 5-7 Ag. 1954... Wien, 1955. pp. 226-247. Physical and medical research of the upper atmosphere and approaches to space. pp. 238-244.

134. POPPEN, J. R.: Five years of space medicine. *J. Aviat. M.* 1954, 25: 366-367.

135. Progress in space medicine [editorial comment] *J. Aviat. M.* 1954, 25: 323-324.

136. SAENGER-BREDT, I.: A propos du IV^{e} Congrès international d'astronautique [On the 4th International congress of astronautics] *Méd. aéronaut.* 1954, 9: 85-88. Brief review of medical papers presented at the 2d - 4th Congresses.

137. SEGAL, H.: Space medicine. *J. So. African Interpl. Soc.* 1954, 1: 24-29 (Nos. 2-3, Apr.-Sept.).

138. [SERYAPIN, A. D.] Man in cosmic space. In: KRIEGER, F. J.: A casebook on Soviet astronautics. [Part I] Santa Monica, Calif., Rand [c 1956]. pp. 81-84. (USAF project Rand. Research memorandum RM-1760, 21 June 1956). First published in: *Teknika-Molodezhi,* 1954, 22: 1-7 (No. 7, Jy.).

139. Sky-high [editorial]. *Brit. M. J.* 1954, 2: 1344-1345.

140. STRUGHOLD, H.: Atmospheric space equivalence. *J. Aviat. M.* 1954, 25: 420-424. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 23).

1953

141. ARMSTRONG, C. R.: Space physiology. *J. Brit. Interpl. Soc.* 1953, 12: 172-175.

142. BIGET, P. L.: Problèmes physiologiques posés par l'astronautique [Physiological problems posed by space flight] Météorologie 1953: pp. 193-201 (No. 31, July-Sept.).

143. Proceedings of a symposium on frontiers of man-controlled flight. Presented at Los Angeles, California, April 3, 1953. . . Edited by HEINZ HABER. Los Angeles, University of California Institute of Transportation and Traffic Engineering [c 1953]. Especially: LOMBARD, C. F.: Crew compartment atmosphere, pp. 5-7; TOBIAS, C. A.: Radiation hazards in high altitude aviation, pp. 21-41; HABER, H.: The mechanical environment of future aircraft, pp. 42-47; MAYO, A. M.: Engineering the cockpit for man, pp. 81-92; KAPLAN, J. and others. Panel discussion on frontiers of man-controlled flight, pp. 97-104.

144. CAMPBELL, P. A.: Atmosphere characteristics of greatest human significance in aviation of the next decade. *Aeronaut. Eng. Rev.* 1953, 23: 50-55 (Ap.) Also: *Roy. Thai Air Force Med. Gaz.* 1953, 2: 389-398.

145. CURTIS, H. T.: The frontiers of man controlled flight. *Pacific rocket society bulletin* 1953, 6: Sect. B., pp. 1-4 (No. 5, My. 10).

146. ERREBO-KNUDSEN, E. O. and others: Verdens-rummets erobring [Conquest of space] Copenhagen, Reitzel, 1953. *Errebo-Knudsen, E. O.* Menneskelegemet og rummet [The human body and space] pp. 51-67.

147. GASPA, P.: Problèmes physiologiques posés par l'astronautique [Physiological problems posed by space flight] *Rev. path. gen. comp.* 1953, 53: 1485-1503.

148. HABER, H.: *Man in space.* N.Y., Bobbs-Merrill, 1953. 291 pp.

149. HABER, H.: Space medicine. In: The complete work of outer space. [New York, *Maco Magazine,* c. 1953]. pp. 24-35. Reprinted 1957.

150. Rocket flights of mammals to 200,000 feet. *J. Brit. Interpl. Soc.* 1953, 12: 6-9. Mice in USAF Aerobee rocket.

494610 O - 59 - 5

151. Space medicine [editorial comment] *Canad. M. Ass. J.* 1953, 69: 535.

1952

152. BARRON, C. I.: The dangers man faces in flights above 50,000 ft. *SAE Journal* 1952, 60: 24-27 (Jy.).

153. BAUER, L. H.: Space medicine. *W. Virginia M. J.* 1952, 48: 326-327.

154. BUETTNER, K. and HABER, H.: The aeropause [letter to editor]. *Science* 1952, 115: 656-657.

155. CAMPBELL, P. A.: Medical aspects of flight above the atmosphere. *J. A. M. A.* 1952, 150: 3-6.

156. CONLEY, M.: A method of supporting the human body structure during space flight. *J. Space Flight* 1952, 4: 3-4 (Nov., No. 9).

157. CURTIS, H. T.: An interview with HEINZ HABER; his views on space medicine and space flight. *Pacific Rocket Soc. Bull.* 1952, 5: Sect. B., pp. 1-4 (No. 11, Nov. 10).

158. DIRINGSHOFEN, H. VON.: Medizinische Probleme der Raumfahrt [Medical problems of space flight] In: GARTMANN, H. (editor): Raumfahrtforschung [Space flight research] München, Oldenburg, 1952. pp. 167-182.

159. DIRINGSHOFEN, H. VON, and BECKH, H. J. A. VON: Aspectos medicos de la astronautica [Medical aspects of space flight] *Rev. nac. aeronaut.*, Buenos Aires 1952, 12: 18-22. (No. 128, Nov.).

160. HABER, H.: Can we survive in space? In: Ryan, C. (editor): *Across the space frontier.* New York, Viking, 1952. pp. 71-97.

161. HABER, H.: Flight at the borders of space. *Sci. Amer.* 1952, 186: 20-23 (Fe.). Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 16).

162. HABER, H.: Manned flight at the borders of space. *J. Amer. Rocket Soc.* 1952, 22: 269-276, 283. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 18).

163. HABER, H.: Medical research in the development of manned rocket flight. *Tech. Data Dig.* 1952, 17: 12-13 (Fe.).

164. HABER, H.: Der Mensch im Weltall [Man in space] Weltraumfahrt 1952, 3: 13-16.

165. [HABER, H.] Problems of space travel. *Sci. News letter* 1952, 62: 180.

166. [HABER, H.] [On space medicine problems.] Hayden Planetarium symposium on space travel, Oct. 12, 1951. *J. Brit. Interpl. Soc.* 1952, 11: 3-9.

167. HECHT, F.: Chemische Probleme des Weltraumfluges [Chemical problems of space flight] In: KÖLLE, H. H. (editor): Probleme aus der astronautischen Grundlagenforschung (Vorträge gehalten anlässlich des III Internationalen Astronautischen Kongresses in Stuttgart, vom 1 bis 6 September 1952) Stuttgart, Gesellschaft für Weltraumforschung, 1952, pp. 30-38. Also: *Weltraumfahrt* 1953, 4: 3-9. Includes biochemical problems.

168. LOMONACO, T.: Alcuni probabili fenomeni fisio-patologici dell'uomo durante i futuri voli siderali [Some probable physiopathological phenomena of man during future space flight.] *Riv. med. aeronaut.* 1952, 15: 3-12.

169. MAYER, C. F.: Exploration of space [editorial]. *Mil. Surg.* 1952, 111: 435-436.

170. SILLEVAERTS, C.: Les problèmes médicaux des vols au-dessus de l'atmosphère [Medical problems of flights above the atmosphere] *Bruxelles méd.* 1952, 32: 2518-2523. Also: Conquête de l'air 1953, No. 2, pp. 21-25. Largely a translation of item 155 of this bibliography.

171. Space medicine [editorial]. *W. Virginia M. J.* 1952, 48: 338.

172. STRUGHOLD, H.: From aviation medicine to space medicine. *J. Aviat. M.* 1952, 23: 315-318, 329. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 21).

173. WHITE, C. S.: The challenge to space medicine. *J. Aviat. M.* 1952, 23: 527-529.

174. WHITE, C. S., and BENSON, O. O., Jr. (editor): Physics and medicine of the upper atmosphere, a study of the aeropause. The proceedings of a symposium on the physics and medicine of the upper atmosphere held at San Antonio, Texas, November 6, 7, 8, 9, 1951; sponsored by the Air University School of Aviation Medicine, Randolph Field, Texas. Arranged by the Lovelace Foundation for Medical Education and Research, Albuquerque, New Mexico. xxiv, 611 pp. Albuquerque, Univ. of New Mexico Press, 1952. Contents: WHITE, C. S.: Introduction, pp. 1-5; MAYO, A. M.: Basic environmental problems relating man and the aeropause as visualized by the aeronautical engineer, pp. 6-22; STRUGHOLD, H.: Basic environmental problems relating man and the highest regions of the atmosphere as seen by the biologist, pp. 23-34; HULBURT, E. O.: Physical characteristics of the upper atmosphere of the earth, pp. 35-53; KELLOGG, W. W.: Temperatures and motions of the upper atmosphere, pp. 54-74; HABER, F.: Adiabatic compression and friction, pp. 75-87; BUETTNER, K.: Thermal aspects of travel in the aeropause, problems of thermal radiation, pp. 88-98; KAPLAN, J.: The chemosphere, pp. 99-108; REGENER, V. H.: Atmospheric ozone, pp. 109-122; HABER, H.: Gravity, inertia and weight, pp. 123-136; WHIPPLE, F. L.: Meteoritic phenomena and meteorites, pp. 137-170; SPECHT, H.: Toxicology of travel in the aeropause, pp. 171-181; NICOLET, M.: Solar physics and the atmosphere of the earth, pp. 182-225; BURNIGHT, T. R.: Ultraviolet

radiation and x-rays of solar origin, pp. 226-238; VAN ALLEN, J. A.: The nature and intensity of the cosmic radiation, pp. 239-266; KREBS, A. T.: The biologic effects of laboratory radiation, pp. 267-289; SCHAEFER, H. J.: The biologic effects of cosmic radiation, pp. 290-315; MULLER, H. J.: Genetic effects of cosmic radiation, pp. 316-330; KAPLAN, J.: Discussion of physics of the upper atmosphere, pp. 331-351; LaPAZ, L.: Meteoroids, meteorites, and hyperbolic meteoritic velocities, pp. 352-393; VAN ALLEN, J. A.: Methods and vehicles for research in the high atmosphere, pp. 394; MOORE, C. B.: Plastic balloons: a platform for experiments in the upper atmosphere, pp. 395-404; NEWELL, H. E., Jr.: Characteristics of the high-altitude rocket as a research tool, pp. 405-411; VAN ALLEN, J. A.: The angular motion of high-altitude rockets, pp. 412-431; BRAUN, W. VON: The return of a winged rocket vehicle from a satellite orbit to the earth, pp. 432-440; SMITH, C. P., Jr.: The physical recovery of instruments and data from a rocket flight, pp. 441-446; KNACKE, T. W.: High-altitude parachute recovery, pp. 447-456; MAYO-WELLS, W. J.: Radio telemetering, pp. 457-460; KREBS, A. T.: Methods of assessing the biologic effects of ionizing radiation, pp. 461-470; NEY, E. P.: Cosmic ray ionization and the methods of measuring it, pp. 471-478; CAMPBELL, P. A.: Known and predicted problems of human travel in the aeropause, pp. 479; SALTER, R. M.: Engineering techniques in relation to human travel at upper altitudes, pp. 480-487; CAMPBELL, P. A.: Human orientation during travel in the aeropause, pp. 488-493; GRAYBIEL, A.: The effect on vision produced by stimulation of the semi-circular canals by angular acceleration and stimulation of the otolith organs by linear acceleration, pp. 494-508; CHRISTY, R. L.: A survey of present techniques for emergency escape from aircraft, pp. 509-515; HENRY, J. P.: Problems of escape during flight above 50,000 feet, pp. 516-532; EVANS, T. C.: A discussion of the potential effects on man of ionizing radiation present in the upper atmosphere, pp. 533-539; TALBOT, J. M.: The biological effects of power plant radiation, pp. 540-543; BUETTNER, K.: Biological effects of radiation of possible extraterrestrial origin, pp. 544-547; TAYLOR, C. L.: Human tolerance for temperature extremes, pp. 548-561; CIBIS, P. A.: Retinal adaptation applicable to visual problems in flight at increasing altitudes, pp. 562-566; LUFT, U.: Physiological limitations in cabin environment and human adaptations, pp. 567-574; HABER, H.: Phasing and co-ordination of medical research with technical and environmental development, pp. 575-581.

1951

175. BENSON, O. O., Jr.: Space medical problems of current interest. In: XIII^{eme} Congrès International de Médecine et de Pharmacie Militaires, Paris, 17-23 juin 1951. Rapports officiels. Tome I. [Paris, 1951] pp. 310-314.

176. BERGERET, P.: Problèmes physiologiques de la vie à bord des satellites artificiels [Physiological problems of life on artificial satellites] *Méd. aéronaut.* 1951, 6: 249-252.

177. CLARKE, A. C.: Interplanetary flight. N.Y., Harper, 1951. *The physiology of space,* pp. 113-117; cosmic rays 117-119; space suit, pp. 119-120.

178. HABER, H.: The human body in space. *Scient. Amer.* 1951, 184: 16-19 (Ja.). Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 12).

179. [HALDANE, J. B. S.] Biological problems of space flight. *J. Brit. Interpl. Soc.* 1951, 10: 154-158.

180. MARBARGER, J. P., ed.: Space medicine; the human factor in flights beyond the earth. Urbana, U. of Ill. press, 1951. 83 pp. Contents: IVY, A. C.: Foreword, pp. 9-11; ARMSTRONG, H. G.: Space medicine in the United States Air Force, pp. 11-13; BRAUN, W. VON: Multi-stage rockets and artificial satellites, pp. 14-30; STRUGHOLD, H.: Physiological considerations on the possibility of life under extraterrestrial conditions, pp. 31-48; HABER, H.: Astronomy and space medicine, pp. 49-61; CAMPBELL, P. A.: Orientation in space, pp. 62-69; BUETTNER, K.: Bioclimatology of manned rocket flight, pp. 70-83.

181. Meeting of informal committee on space medicine. *J. Aviat. M.* 1951, 22: 163-164.

182. Meeting of the Space Medicine Association. Denver, Colorado, May 17, 1951. *J. Aviat. M.* 1951, 22: 544-547.

183. ST. GERMAIN, A. V.: Physiological aspects of interplanetary travel. *Amer. Helicopter* 1951, 21: 10-12.

184. Space medicine, a look at the depth of the universe. *Tech. data Dig.* 1951, 16: 14-15 (Oct.).

185. STRUGHOLD, H.: The human time factor in flight. II. Chains of latencies in vision. *J. Aviat. M.* 1951, 22: 100-108. Author notes special importance of problem in rocket flight.

186. STRUGHOLD, H., and others: Where does space begin? Functional concept of the boundaries between atmosphere and space. *J. Aviat. M.* 1951, 22: 342-349, 357. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 15).

1950

187. ESCLANGON, E.: La navigation astronautique dans ses rapports avec la physiologique [Space flight in relation to physiology] *Astronomie* 1950, 64: 279-287.

188. HENRY, J. P.: Report on the 1950 Symposium of space medicine. *J. Space Flight* 1950, 2: 8-11 (My.).

189. LANGER, E.: Medizinische Probleme der Raumfahrt [Medical problems of space flight] *Med. Klin. Berl.* 1950, 45: 1634-1636.

190. LOMONACO CROCE, T.: L'Uomo in volo. Rome, Abruzzini, 1950. Alcune probabili manifestazioni dell'organismo umano nel futuro volo

intersiderale [Some probable reactions of the human organism in future interplanetary flight] pp. 469-476.

191. Space medicine [editorial comment]. *J. Aviat. M.* 1950, 21: 359-360.

1949

192. ARMSTRONG, H. G. and others: Aero medical problems of space travel. Panel meeting, School of Aviation Medicine. *J. Aviat. M.* 1949, 20: 383-417. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 11).

193. CAMPBELL, P. A.: Cybernetics and aviation medicine. *J. Aviat. M.* 1949, 20: 439-442.

194. STORY, V.: *Biological aspects of a space journey.* Chicago Rocket Society. Collected technical reports. Chicago, the Society, 1949. pp. 48-50.

1948

195. HENRY, J.: Speculations on space travel. *Rocket News letter* (Chicago) 1948, 2: 6-9 (No. 3, Oct.).

196. LOMONACO CROCE, T.: L'Organismo umano resisterà alle variazioni ambientali di un viaggio interplanetario? [Will the human organism be able to withstand the environmental changes of an interplanetary journey?] *Riv. med. aeronaut.* 1948, 11: 84-87.

1947

197. GOUGEROT, L.: Perspectives physiologiques soulevées par le problème astronautique [Physiological problems of space flight] *Méd. aéronaut.* 1947, 2: 63-74.

1936

198. ARMSTRONG, H. G.: The medical aspects of the National Geographic Society-U.S. Army Air Corps stratosphere expedition of November 11, 1935. *J. Aviat. M.* 1936, 7: 55-62.

1931

199. NORTON, T. W.: Physiological implication of rocket flight. *Bull. Amer. Interpl. Soc.* 1931, No. 9, My., pp. 2-5.

1929

200. OBERTH, H.: Wege zur Raumschiffahrt. Munich, Oldenburg, 1929. Acceleration pp. 90-99; Fractional g and weightlessness pp. 100-106; Cities TSIOLKOVSKII on immersion in liquid to counteract g, p. 108.

1928

201. VALIER, M. VON: Medizin und Raumschiffahrt [Medicine and spaceship flight] Die Rakete; *Zeitschrift des Vereins für Raumschiffahrt E. V.* 1928, 2: 13-15, 20-22.

SEALED CABIN PROBLEMS

1958

202. Air Crew Equipment Laboratory. Naval Air Material Center, Phila., Pa. Environmental requirements of sealed cabins for space and orbital flights. Part I. Introduction to a confinement experiment and description of the test chamber... Reported by E. HENDLER [and] D. A. MANCINELLI. v. 4[6] leaves. (NAMC-ACEL-383, 27 August 1958. TED NAM AE-1403)

203. Air Crew Equipment Laboratory. Naval Air Material Center, Phila., Pa. Environmental requirements of sealed cabins for space and orbital flights. Part 2. Continuous exposure of human subjects to increased oxygen tension for seven days... Reported by E. L. MICHEL and R. W. LANGEVIN. v. 6[6] leaves. (NAMC-ACEL-384, 10 September 1958. TED NAM AE-1403, part 2). Summary of the data presented as: Men survive high oxygen [by C. F. GELL] *Sci. News Letter* 1958, 74: 343.

204. Air Crew Equipment Laboratory. Naval Air Material Center, Phila., Pa. Environmental requirements of sealed cabins for space and orbital flights. Part 3. Performance and habitability aspects of extended confinement... Reported by J. GAITO [and others]. v. 31 [21] leaves. (NAMC-AGEL-385, 26 September 1958. TED NAM AE-1403, part 3).

205. Air Crew Equipment Laboratory. Naval Air Material Center, Phila., Pa. Environmental requirements of sealed cabins for space and orbital flights. Part 4. Physiological changes produced in humans by prolonged confinement in an oxygen-rich environment... Reported by L. M. LIBBER [and others]. v. 5[5] leaves. (NAMC-ACEL-386, 8 October 1958. TED NAM AE 1403, part 4).

206. BORISOV, V.: Problems in science and technology: hermetic cabin of a space vehicle. English summary: U. S. Central Intelligence Agency. Scientific information report, 25 July 1958, pp. 77-79. First published: *Sovetskaya Aviatsiya* 18 June 1958, p. 3. The Russian article includes a review of some recent American experience.

207. CLAMANN, H. G.: Problems of respiratory metabolism in sealed cabins. In: Royal College of aeronautics, London. High altitude and satellite rockets; a symposium held at Cranfield, England, 18th-20th July 1957. Published jointly by the Royal Aeronautical Society [and] the British Interplanetary Society. London, 1958. pp. 102-106, and Joint discussion pp. 111-114. Also: (with minor changes and without the discussion) USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 40).

208. GAFFORD, R. D., and others: The provision of respiratory gas exchange for small primates by use of a photosynthetic gas exchanger; preliminary observations. 5 pp. (USAF School of Aviation Medicine, Randolph AFB, Texas. [Report] 58-126, October 1958)

209. INGRAM, W. T.: Orientation of research needs associated with environment of closed spaces. 21 l. (U. S. Air Force Office of Scientific Research. AFOSR TN 58-106). Paper presented to meeting of Amer. Astronautical Soc., N. Y., Jan. 30, 1958.

210. KONECCI, E. B.: Human factors and space cabins. *Astronautics* 1958, 3: 42-43, 71-73.

211. LEWIS, C.: USAF school simulates living in space. *Aviation Week* 1958, 68: 49, 51, 53, 55, 57, 58-59, 61 (No. 4, Ja. 27). School of Aviation Medicine sealed cabin described.

212. SCANO, T., and others: La depurazione dell'aria in abitacoli spaziali: sulla possibilita de rimuovere con metodo fisico l'anidride carbonica ed altre sostanze prodotte dall'uomo [The purification of air in space cabins: on the possibility of removing carbon dioxide and other substances produced by man through physical methods]. *Rivista aeronautica* (Rome) 1958, 34: 531-550.

213. SIMONS, D. G., and ARCHIBALD, E. R.: Selection of a sealed cabin atmosphere. *J. Aviat. M.* 1958, 29: 350-357.

214. WARD, J. E., and STEINKAMP, G. R.: Human engineering of the sealed space cabin. *Texas J. M.* 1958, 54: 356-357.

1957

215. DEMPSEY, C. A., and others.: Long-term human confinement in space equivalent vehicles. *J. Astronautics* 1957, 4: 52-53, 59.

216. EDWARDS, C. P.: Progress report. The culture of algae. 24, [5] 1. (U. S. Air Force Office of Scientific Research. AFOSR report No. 57-378, June 1957) (Contract No. AF 18 (603)-71). "Part of report on the engineering biotechnology of handling wastes resulting from a closed ecological system." Contract with New York University, College of Engineering, Research Division.

217. GAUME, J. G.: Plants as a means of balancing a closed ecological system. *J. Astronautics* 1957, 4: 72-75. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 37).

218. GIBERT, A.: L'Utilization des plantes pour la regénération de l'oxygène à partir du gaz carbonique [Use of plants to regenerate oxygen from carbon dioxide] *Fusées et recherche aéronautique* 1957, 2: 69-74.

219. GUSTAVSON, J.: Synthetic atmospheres for space ships. *Astronautics* 1957, 2: 48, 62-63 (No. 4, Nov.).

220. INGRAM, W. T.: Environmental problems connected with space ship occupancy. In: *American Astronautical Society.* 3d Annual Meeting. Proceedings, N. Y., The Society, [1957] 170 pp.

221. INGRAM, W. T.: Progress report. Skin excretions. 8 l. (U. S. Air Force Office of Scientific Research. AFOSR report No. 58-270, October 1957) (Contract No. AF 18 (603)-71) "Part of Report on the engineering biotechnology of handling wastes resulting from a closed ecological system." Contract with New York University, College of Engineering, Research Division.

222. MASSON, H. J.: Progress report. Study of methods for obtaining oxygen from carbon dioxide. 15, [3] l. (U. S. Air Force Office of Scientific Research. AFOSR report No. TN 57-379, June 1957) (Contract No. AF 18 (603)-71). "Part of Report on the engineering biotechnology of handling wastes resulting from a closed ecological system." Contract with New York University, College of Engineering, Research Division.

223. PALEVSKY, G.: Progress report. Handling air contaminants resulting from a closed ecological system. 14 [2] l. (U. S. Air Force Office of Scientific Research. AFOSR report No. 58-269, July 1957) (Contract No. AF 18(603)-71) "Part of Report on the engineering biotechnology of handling wastes resulting from a closed ecological system." Contract with New York University, College of Engineering, Research Division.

224. SLOTE, L.: Progress report. Thermal energy exchange with specific application to waste handling in a closed ecological system. 7 l. (U. S. Air Force Office of Scientific Research. AFOSR report no. 58-268, July 1957) (Contract No. AF 18(603)-71). "Part of Report on the engineering biotechnology of handling wastes resulting from a closed ecological system." Contract with New York University, College of Engineering, Research Division.

225. STRUMZA, M. V.: Les conditions respiratoires dans les fusées intercontinentales [Respiratory conditions in intercontinental rockets] *Fusées et recherche aéronautique* 1957, 2: 241-243.

226. University of Texas. Laboratory of Algal Physiology. Study of a photosynthetic gas exchanger as a method of providing for the respiratory requirements of the human in a sealed cabin [Parts I-II] Report to the Air Research and Development Command on work performed by the Laboratory of Algal Physiology of the University of Texas under Contract AF 18 (600)-618 during the period May 1, 1953 to October 31, 1955 [and] [during the period November 1, 1955 to November 30, 1957] 27 [50] leaves.
JACK MYERS, principal investigator.

1956

227. DIAZ WALKER, J. W.: Los problemas fisiologicos del microclima: cabina astronáutica. *Revista Asoc. Argentina Interplan.* 1956, 3: 27-31 (No. 11, Ap. -Je.).

228. DRYDEN, C. E., and others.: Artificial cabin atmosphere systems for high altitude aircraft. xxiii, 395 pp. (USAF Wright Air Development Center. WADC Technical Report 55-353, November 1956).

229. HAVILAND, R. P.: Air for the space ship. *J. Aeronautics* 1956, 3: 31-32, 48. Substitutes for nitrogen considered and rejected.

230. SIMONS, D. G.: Surface temperatures of animal capsules floating above 80,000 feet. (Holloman Air Development Center. Technical report 56-6, May 1956.)

231. SIMONS, D. G., and PARKS, D. P.: Climatization of animal capsules during upper stratosphere balloon flights. *Jet propulsion* 1956, 26: 565-568.

232. STRUGHOLD, H.: The U. S. Air Force experimental sealed cabin. J. *Aviat. M.* 1956, 27: 50-52. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 28).

233. U. S. Office of Naval Research. Proceedings, Conference on photosynthetic gas exchangers, Washington, D. C., June 11, 12, 1956. iii, 96 pp. (ONR Symposium report ACR-13).

1955

234. HALDANE, J. B. S.: The purification of air during space travel. *J. Brit. Interpl. Soc.* 1955, 14: 87-89.

1954

235. BASSHAM, J. A.: Atmospheric control by photosynthesis. U. S. Office of Naval Research. *Research reviews* 1954, Nov., pp. 7-12.

236. BASSHAM, J. A.: Use of controlled photosynthesis for maintenance of gaseous environment. 10 pp. (University of California Radiation laboratory. UCRL 2707, Sept. 1954).

237. FENNO, R. M.: Man's milieu in space; a summary of the physiologic requirements of man in a sealed cabin. *J. Aviat. M.* 1954, 25: 612-622. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 26).

238. HOFF, E. C., and GREENBAUM, L. J.: A bibliographical sourcebook of compressed air, diving and submarine medicine. Volume II. xii, 368 pp. Washington, D. C. [U. S. Govt. Print. Off.] 1954. (Navmed P-5033, November 1954). Especially: Physiological effects of high carbon dioxide content in environmental air, pp. 54-71; Heat and humidity problems, pp. 71-95.

239. MURRAY, W. D.: A gondola for physiological research in the atmosphere. *J. Aviat. M.* 1954, 25: 354-360.

240. MYERS, J.: Basic remarks on the use of plants as biological gas exchangers in a closed system. *J. Aviat. M.* 1954, 25: 407-411. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome*

of space medicine (Item 24). Work under USAF Contract No. AF 18(600) 618 with the University of Texas, Dept. of Zoology.

241. NICOLL, N. R.: Design of the life compartment necessary for space travel. *J. Brit. Interpl. Soc.* 1954, 13: 277-282.

1953

242. BOWMAN, N. J.: The food and atmospheric control problem on space vessels. I. Chemical purification of air. II. The use of algae for food and atmosphere control. *J. Brit. Interpl. Soc.* 1953, 12: 118-123, 159-167. Also in: CARTER, L. J. (editor): *Realities of space travel.* London, Putnam, 1957. pp. 275-291.

243. BRAUN, W. VON.: "Das Leben in der Büchse": zum Problem der Atemluftversorgung in Raumschiffen [On the maintenance of adequate respiratory air in space ships]. *Natur u. Technik* 1953, 7: 54-55.

244. LEE, M. F., and others.: Basic requirements for survival of mice in a sealed atmosphere. *J. Aviat. M.* 1954, 25: 399-406, 432. Also: USAF Wright Air Development Center. WADC Technical report 53-116, May 1953. iii, 10 pp.

1952

245. CLAMANN, H. G.: Continuous recording of oxygen, carbon dioxide and other gases in sealed cabins. *J. Aviat. M.* 1952, 23: 330-333. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 20).

1949

246. BOWMAN, N. J.: Nutritional and other physiological problems on extended space flights. *Rocket News letter,* Chicago 1949, 2: 6-11 (No. 7, Feb.); 8-16 (No. 8, Mar.).

1947

247. ROSS, H. E.: Green plants as atmosphere regenerators. *Bull. Brit. Interpl. Soc.* 1947, 2: 7.

1946

248. ROSS, H. E.: Air conditioning problems of space travel. *Bull. Brit. Interpl. Soc.* 1946, 1: 49-52.

1936

249. ARMSTRONG, H. G.: The medical problems of sealed high-altitude aircraft compartments. *J. Aviat. M.* 1936, 7: 2-8.

1935

250. ARMSTRONG, H. G.: The physiological requirements of sealed high altitude aircraft compartments. 41 l. (U. S. Air Corps technical report No. 4165, December 19, 1935).

1931

251. DEISCH, N.: The navigation of space. *Bull. Amer. Interpl. Soc.* 1931, No. 11, Aug., pp. 4-10.

ACCELERATION/DECELERATION

1958

252. BECKH, H. J. VON.: Multi-directional G protection in space flight and during escape; a theoretical approach. *J. Aviat. M.* 1958, 29: 335-342.

253. BECKH, H. J. A. VON.: Physiology of launching and re-entry stress in rodents. iii, 8 pp. (U. S. Air Force Missile Development Center, Holloman AFB, New Mexico. AFMDC TN 58-11, August 1958).

254. BECKH, H. J. A. VON, and SCHOCK, G. J. D.: Centrifuge experiments on high G-loads in mice and their possible alleviation by multi-directional anti-G devices. iii, 14 pp. (U. S. Air Force Missile Development Center, Holloman AFB, New Mexico. AFMDC TN 58-10, August 1958).

255. BONDURANT, S., and others.: Human tolerance to some of the accelerations anticipated in space flight. iii, 15 pp. (Wright Air Development Center. WADC Technical report 58-156, April 1958). Also *U. S. Armed Forces M. J.* 1958, 9: 1093-1105.

1957

256. BROWNE, M. K.: Accelerations in space medicine. *Spaceflight* 1957, 1: 139-142.

257. HESSBERG, R. R., JR.: Accelerative forces associated with leaving and re-entering the earth's gravitational field. *J. Astronautics* 1957, 4: 6-8. "... physiologically the accelerative forces are tolerable. However, motor performance is impaired and psychomotor function is unpredictable." p. 6.

258. MARGARIA, R.: Le forze di accelerazione e la condizione di subgravita in volo [Acceleration forces and the subgravity state during flight] *Riv. med. aeronaut.* 1957, 20: 175-186. Polyglot summaries. Describes immersion of animals in liquids to counteract g.

1956

259. DIRINGSHOFEN, H. VON.: 25 Jahre in der luftfahrtmedizinischen Erforschung der Beschleunigungen; ein Rückblick und Ausblick [25 years aeromedical research of acceleration: retrospect and prospect] *Medizinische* 1956, pp. 1843-1847 (No. 52, 29 Dec.). Acceleration problem in manned rockets, p. 1846; problems of weightlessness, pp. 1846-1847.

1955

260. PRESTON-THOMAS, H., and others.: Human tolerance to multistage rocket acceleration curves. *J. Aviat. M.* 1955, 26: 390-398. "The

present paper shows that a very large proportion of feasible rocket designs impose no undue strain on the passengers." p. 390.

261. RAFFONE, J. J.: Acceleration force and space flight. *J. Astronautics.* 1955, 2: 100-104.

1954

262. WEBSTER, A. P., and HUNTER, H. N.; Acceleration. *J. Aviat. M.* 1954, 25: 378-379. Chart showing effects of G maximums by type on animals and humans.

1953

263. GERATHEWOHL, S. J.: Die Psychophysiologie der Beschleunigungswirkung [Psychophysiology of acceleration] *Weltraumfahrt* 1953, 4: 15-19.

264. HABER, F.: Human flight at the limits of the atmosphere; G forces and weight in space travel. *J. Brit. Interpl. Soc.* 1953, 12: 32-34. Also: *Sky and Telescope,* 1953, 12: 97-98, 114 (No. 4, Fe.).

1952

265. BALLINGER, E. R.: Human experiments in subgravity and prolonged acceleration. *J. Aviat. M.* 1952, 23: 319-321, 372.

266. STEWART, W. K.: The physiological effects of gravity. *Lectures on the scientific basis of medicine* 1952-1953, 2: 334-342.

1951

267. CROCCO, G. A.: La sopportazione fisiologica nei missili a reazione [Physiological endurance and rocket flight]. *Aerotecnica,* Rome, 1951, 31: 55-59.

268. DIRINGSHOFEN, H. VON: Beschleunigungswirkungen im Röntgenbild [Acceleration effects in Rontgen exposure] *Weltraumfahrt* 1950, 1: 135-137.

1950

269. SCHNEIDER, J.: Der Mensch im Schwerfeld [Man in a gravitational field]. *Weltraumfahrt* 1950, 1: 82-85.

1949

270. HENRY, J.: Acceleration as a limit in rocket flight. In Chicago Rocket Society: *Collected technical reports.* Chicago, the Society, 1949. pp. 45-47.

1932

271. [NAYLOR, J. L.] Man's ability to withstand high accelerations studied. *Astronautics* 1932, No. 20, Je., pp. 6-7.

272. NORTON, T. W., and MANNING, L. E.: The physiology of acceleration. *Astronautics* 1932, No. 21, Jy., pp. 4-6.

FRACTIONAL AND ZERO GRAVITY

1958

273. Cornell probes weightlessness. *Aviation Week* 1958, 68: 26-28. (No. 2, Ja. 13). Research of B. R. BUGELSKI at the Cornell Aeronautical Laboratory described. See also: *Sci. News Letter* 1958, 73: 39. Dr. Bugelski's research report is listed as entry 281a of this bibliography.

274. GERATHEWOHL, S. J., and STALLINGS, H. D., JR.: Experiments during weightlessness; a study of the oculo-agravic illusion. 22 pp. (U. S. School of Aviation Medicine, Randolph AFB, Texas. [Report] 58-105, July 1958). Also (with omission of appendixes): *J. Aviat. M.* 1958, 29: 504-516.

275. GIBERT, A. P., and others.: Etat actuel de l'expérimentation animale et humaine dans le vol en gravité nulle [Present state of animal and human experimentation in weightless flight] *Méd. aéronaut.* 13: 177-188. English summary.

276. KNIGHT, L. A.: An approach to the physiologic simulation of the null-gravity state. *J. Aviat. M.* 1958, 29: 283-286. On spatial orientation during immersion in water.

277. SCHOCK, G. J. D.: Apparent motion of a fixed luminous target during subgravity trajectories. 12 pp. (U. S. Air Force Missile Development Center, Holloman, AFB, New Mexico. Report No. AFMDC TN-58-3, Feb. 1958).

278. SCHOCK, G. J. D.: Sensory reactions related to weightlessness and their implications to space flight. 10 pp. (U. S. Air Force Missile Development Center, Holloman AFB, New Mexico. Report No. AFMDC TR-58-6, April 1958).

279. U. S. Air Force Missile Development Center, Holloman Air Force Base, New Mexico. Office of Information Services. Historical Division. History of research in subgravity and zero-G at the Air Force Missile Development Center, Holloman Air Force Base, New Mexico, 1948-1958. by [DAVID BUSHNELL] The Center [1958]. 46 pp.

280. WARD, J. E.: Requirements for experimental zero-gravity parabolas. *J. Aviat. M.* 1958, 29: 428-432.

1957

281. BIGET, P. L., and BOITEAU, H.: Quelques aspects physiologiques du vol "sans pesanteur" [Some physiological aspects of weightlessness in flight.] *Fusées et recherche aéronautique* 1957, 2: 161-165.

281a. BUGELSKI, B. R.: Behavioral aspects of weightlessness. Part I. 41 pp. (Holloman Air Development Center, Holloman AFB, New

Mexico. Report No. Cornell Aeronautical Laboratory 0-1186-V-1, November 1957).

282. GERATHEWOHL, S. J.: Weightlessness. *Astronautics* 1957, 2: 32-34, 74-75 (No. 4, Nov.). Responses of 47 subjects.

283. GERATHEWOHL, S. J., and STALLINGS, H. D.: The labyrinthine posture reflex (righting reflex) in the cat during weightlessness. *J. Aviat. M.* 1957, 28: 345-355. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 36).

284. GERATHEWOHL, S. J., and others. Producing the weightless state in jet aircraft. 11 pp. (USAF School of Aviation Medicine, Randolph Field, Texas. [report] 57-143, August 1957). Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 10); and: *Astronautica Acta,* 1958, 4: 15-24.

285. GERATHEWOHL, S. J., and others.: Sensomotor performance during weightlessness; eye-hand coordination. *J. Aviat. M.* 1957, 28: 7-12. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 34).

286. LANSBERG, M. P.: The function of the vestibular sense organ and the construction of a satellite. In: *Aeromedica Acta.* Special edition, containing the scientific communications of the first European congress of Aviation Medicine, Scheveningen (the Hague) 30 Oct.-1 Nov. 1956. Soesterberg, National Aeromedical Centre, 1957. pp. 69-77. Problems of simulated g.

287. LAWDEN, D. F.: The simulation of gravity. *J. Brit. Interpl. Soc.* 1957, 16: 134-140.

288. LOMONACO, T., and others.: Alcuni dati sperimentali fisiopsichici sugli effetti delle accelerazioni e della sub-gravità previsti nell'uomo lanciato nello spazio [Some physio-psychic experimental data on the effects of accelerations and sub-gravity predictable for man in space[*Riv. Med. Aeronaut,,* 1957, 20: 363-390. Polyglot summaries. Experiments on 30 subjects.

289. MAC. The problem of weightlessness. Conquest (Johannesburg) 1957, 1: 4-5, 32 (No. 3, Nov.). Personal experiences.

290. SCHACK, G. J. D., and SIMONS, D. G.: A technique for instrumenting subgravity flights. *J. Aviat. M.* 1957, 28: 576-582. Same title: U. S. Air Force Missile Development Center, Holloman AFB, New Mexico. AFMDC TN 58-4, Feb. 1958. 14 pp.

291. SLATER, A. E.: The problem of weightlessness. *Spaceflight* 1957, 1: 109-113.

292. STRUGHOLD, H.: Mechanoreceptors, gravireceptors. *J. Astronautics* 1957, 4: 61-63. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 39).

293. WALTON, H., JR.: A device for artificial production of alternating gravitational forces. *J. Aviat. M.* 1957, 28: 291-294.

294. WARD, J. E.: Requirements for present-day experimental zero gravity parabolas. 6 pp. (USAF School of Aviation Medicine, Randolph Field, Texas, [report] 57-121, July 1957).

1956

295. BECKH, H. J. A. VON.: Gravity changes in aircraft and ships. *J. Brit. Interpl. Soc.* 1956, 15: 73-81.

296. GERATHEWOHL, S. J.: Personal experiences during short periods of weightlessness reported by sixteen subjects. *Astronautica Acta,* 1956, 2: 203-217. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 29). Italian translation: Rev. *Med. Aeronaut.* 1957, 20: 17-46. (Suppl. to No. 1, Jan. -Mar.)

1955

297. ISAKOV, P. K.: Problems of weightlessness. In: KRIEGER, F. J. A casebook on Soviet Astronautics, [Part I] Santa Monica, Calif., Rand [c. 1956]. pp. 229-239. (USAF project Rand. Research memorandum, RM-1760, 21 June 1956). First published in: *Nauka i Zhizn'* 1955, 22: 17-20 (No. 12, Dec.)

298. SIMONS, D. G.: Review of biological effects of subgravity and weightlessness. *Jet Prop.* 1955, 25: 209-211.

1954

299. BECKH, H. J. A. VON: Experiments with animals and human subjects under sub- and zero-gravity conditions during the dive and parabolic flight. *J. Aviat. M.* 1954, 25: 235-241.

300. COE, L. A.: Some notes on the reactions of aircraft pilots to zero gravity. *J. Brit. Interpl. Soc.* 1954, 13: 244. Letter to the editor. 20 subjects up to 20 seconds.

301. Film of monkey and mice in free fall. *J. Brit. Interpl. Soc.* 1954, 13: 223-224.

302. GERATHEWOHL, S. J.: Comparative studies on animals and human subjects in the gravity-free state. *J. Aviat. M.* 1954, 25: 412-419. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 25).

1953

303. BECKH, H. J. A. VON.: Untersuchungen über Schwerlosigkeit an Versuchspersonen und Tieren Während des lotrechten Sturzfluges [Investigation of weightlessness of humans and animals during vertical dives] In *Space-flight problems;* being a complete collection of all lectures held at the Fourth Astronautical Congress, Zurich, 1953. Biel, Laubscher, [1953] pp. 196-202.

304. GERATHEWOHL, S. J.: Zur Frage der Orientierung im Schwerefreien Zustand [On the problem of orientation in the gravity free state] in: *Space flight problems;* being a complete collection of all lectures held at the Fourth Astronautical Congress, Zurich, 1953. Biel, Laubscher, [1953] pp. 189-195. English abstract: *Mil. Surg.* 1953, 113: 342-343.

305. GOUGEROT, L.: Loi de Weber-Fechner et variations de la pesanteur apparente [The Weber-Fechner law and variations of apparent weight] *Med. aé*ronaut. 1953, 8: 119-125.

306. HABER, H., and GERATHEWOHL, S. J.: Physik und Psychophysick der Gewichtslosigkeit [Physics and psychophysics of weightlessness] *Weltraumfahrt* 1953, 4: 44-50.

307. LOMONACO, T.: Primi studi sugli effetti fisiopatologici causati dalla subgravita in animali lanciati, dentro missili, nell'alta atmosfera [Initial studies of the physiopathological effects caused by subgravity on animals in rockets] *Riv. med. aeronaut.* 1953, 16: 192-199. Story of U. S. research.

308. MARGARIA, R.: La condizione di subgravità e la sottrazione dall'effetto delle accelerazioni [Subgravity and the elimination of the effect of acceleration] *Riv. med. aeronaut.* 1953, 16: 469-474. Polyglot summaries. On immersion in liquid to achieve effect.

1952

309. BERGERET, P.: La vie dans un milieu sans pesanteur [Life in the weightless state] *Atomes* 1952, 7: 219-224.

310. GATLAND, K. W.: Design for zero G; a man carrying rocket for physiological research in near space. *Flight,* London, 1952, 61: 744, 775, 779.

311. GERATHEWOHL, S. J.: Physics and psychophysics of weightlessness; visual perception. *J. Aviat. M.* 1952, 23: 373-395. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 22).

312. HABER, F.: Study on subgravity states. 9 pp. (USAF School of Aviation Medicine, Randolph Field, Texas. Project number 21-34-003. Report number 1, April 1952). Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 4).

313. HENRY, J. P. and others.: Animal studies of the subgravity state during rocket flight. *J. Aviat. M.* 1952, 23: 421-432.

314. LOMONACO, T., and others.: Sulla fisiopatologia durante il volo nello spazio: comportamento della coordinazione motoria in soggetti sottoposti a valori di accelerazione variante da 3 a zero g [Physiopathology during space flight: motor coordination in subjects exposed to acceleration values varying from 3 g to 0 g] *Riv. med. aeronaut.* 1957, 20: 76-96 (Suppl. to No. 1, Ja. -Mar.). Polyglot summaries.

494610 O - 59 - 6

315. SLATER, A. E.: Sensory perceptions of the weightless condition. In KOLLE, H. H. (editor): Probleme aus der astronautischen Grundlagenforschung (Vorträge gehalten anlässlich des III Internationalen Astronautischen Kongresses in Stuttgart, Vom 1 bis 6 September 1952) Stuttgart, Gesellschaft für Weltraumforschung, 1952. pp. 219-225. Also: Annual report. Brit Interpl. Soc., 1952, pp. 342-348 and: CARTER, L. J. (editor): *Realities of space travel.* London, Putnam, 1957. pp. 266-274.

316. THOMPSON, L. N.: Man without gravity; the physiological and psychological problems of space flight. *Flight,* London, 1952, 61: 298-300.

1951

317. HABER, H., and GERATHEWOHL, S. J.: Physics and psychophysics of weightlessness. *J. Aviat. M.* 1951, 22: 180-189. Largely on interpretation of mechanoreceptor information. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 14).

318. [STRUGHOLD, H., and others] Wie wird sich der menschliche Organismus voraussichtlich im schwerefreien Raum verhalten? [What is the probable behavior of the human organism in gravity free space?] *Weltraumfahrt* 1951, 2: 81-88. See also remarks on this by G. W. NORBERT SCHOLZ: *Ibid.,* 108.

1950

319. Elevators to help determine effects of reduced gravity on supersonic pilots. *Technical Data Dig.* 1950, 9: (No. 9) 11-12.

320. GAUER, O., and HABER, H.: Man under gravity free conditions. In: U. S. Department of the Air Force. German aviation medicine, World War II. Washington, U. S. Govt. Print. Off., [1950]. pp. 641-644.

321. HABER, F., and HABER, H.: Possible methods of producing the gravity-free state for medical research. *J. Aviat. M.* 1950, 21: 395-400. Also: USAF School of Aviation Medicine, Randolph Field, Texas. Special project, January 1951. 6 pp. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 2).

322. SLATER, A. E.: The balancing mechanism of the inner ear. *J. Brit. Interpl. Soc.* 1950, 9: 18-23.

323. STRUGHOLD, H.: The mechanoreceptors of skin and muscles under flying conditions. In: U. S. Department of the Air Force. German aviation medicine, World War II. Washington, U. S. Govt. Print. Off., [1950]. pp. 994-999.

1948

324. DIRINGSHOFEN, H. VON.: Das gesundheitliche Problem des Weltraumfluges: das Fehlen der Schwerkraft [Health problems of space flight: absence of gravity] *Grenzgeb. med.* 1948, 1: 144-145.

COSMIC RADIATION

1958

325. LEAVITT, W.: Cosmic radiation–how much of a barrier. *Air Force* 1958, 41: 52-55 (Oct. No. 10).

325a. SANDEMAN, T. F.: Cosmic radiation and its possible biological effects. *Spaceflight* 1958, 1: 291-296.

326. TOBIAS, C. A.: Radiation hazards in space flight. 32 pp. (University of California Radiation Laboratory. UCRL-8115, January 1958).

327. TOBIAS, C. A., and others.: A summary of the Berkeley conference on biological effects of cosmic rays and accelerated heavy ions. 14 pp. (University of California Radiation Laboratory, UCRL-8201, Mar. 10, 1958). "In this report...we are primarily concerned with cosmic rays as a potential hazard to space travel." p. 5.

1957

328. EUGSTER, J.: Zur biologischen Wirkung der Kosmischen Strahlung (KS) in grossen Höhen [On the biological effect of cosmic radiation at high altitude] *Raketentechnik u. Raumfahrtforsch.*, 1957, 1: 71-72.

329. GRAUL, E. H.: Radiobiologische Probleme der Raumfahrt [Radiobiological problems of space flight] *Raketentechnik u. Raumfahrtforsch.* 1957, 1: 40-47.

330. SHEPHERD, L. R.: Cosmic radiation and space flight. In: *Bates, D. R.* (editor): *Space research and exploration.* London, Eyre. 1957. pp. 71-85. American edition: N.Y., William Sloane Associates, 1958. pp. 84-102.

331. SHEPHERD, L. R.: The possibility of cosmic-ray hazards in high altitude and space flight. *J. Brit. Interpl. Soc.* 1953, 12: 197-212. Also in: CARTER, L. J. (editor): *Realities of space travel.* London, Putnam, 1957. pp. 231-250.

332. SIMONS, D. G.: Effetti biologici delle radiazioni cosmiche primarie [Biological effects of primary cosmic radiation] *Riv. med. aeronaut.* 1957, 20: 47-75. (Supple. to No. 1, Jan.-Mar.). Polyglot summaries.

333. STEINMETZ, C. H.: Techniques used for monitoring biological specimens on the 1954 and 1955 Aero Medical Field Laboratory balloon flights. iii, 11 pp. (Holloman Air Development Center. Technical Note, HADC TN 57-1).

1956

334. CHASE, H. B., and POST, J. S.: Damage and repair in mammalian tissues exposed to cosmic ray heavy nuclei, *J. Aviat. M.* 1956, 27: 533-540.

335. EUGSTER, J. A. G., and others.: Effects on living tissue by primary cosmic ray particles. 21 [13] p. (Air Force Office of Scientific Research Tr 56-19, February 1956).

336. GOLDEN, A., and SCHAEFER, H. J.: Microphocal alpha irradiation as a means of simulating exposure to heavy nuclei of the primary cosmic radiation. *J. Aviat. M.* 1956, 27: 322-327.

337. HARLOW, H. F., and others. Exposure of primates to cosmic radiation above 90,000 feet. *J. Comp. Physiol. Psych.* 1956, 49: 195-200.

338. HAYMAKER, W.: Operation stratomouse. *Mil. M.* 1956, 119: 151-171.

339. KAPLAN, J., and KALLMANN, H. K.: Progress in upper atmosphere physics during the last decade. *J. Aviat. M.* 1956, 27: 345-355.

340. SCHAEFER, H. J.: Optimum altitudes for biological experimentation with the primary cosmic radiation. *J. Aviat. M.* 1956, 27: 512-521.

341. SIMONS, D. G., and PARKS, D. P.: Improved techniques for exposing animals to primary cosmic ray particles. *J. Aviat. M.* 1956, 27: 317-321.

342. SIMONS, D. G., and STEINMETZ, C. H.: The 1954 Aeromedical Field Laboratory balloon flights; physiological and radiobiological aspects. *J. Aviat. M.* 1956, 27: 100-110.

343. SINGER, S. F.: Cosmic ray effects on matter at high altitudes. *J. Aviat. M.* 1956, 27: 111-116.

344. YAGODA, H.: Frequency of thin down hits by heavy primary nuclei in emulsion and tissue. *J. Aviat. M.* 1956, 27: 522-532.

1955

345. CAMPBELL, B.: Research on the biological effects of the heavy particle cosmic rays. iii, 13 pp. (Holloman Air Development Center. HADC-TR-55-8, December 1955.)

346. CHASE, H. B., and others.: Effects on the skin by cosmic ray heavy particles. iii, 7 pp. (Holloman Air Development Center. HADC-TR-55-2, May 1955).

347. EUGSTER, J.: Demonstration über den Nachweis der kosmischen Strahlung im menschlichen Körper [On the determination of cosmic radiation in the human body] In: HECHT, F. (editor): Bericht über den V Internationalen astronautischen Kongress, Innsbruck, 5-7 Ag. 1954...Wein, 1955. pp. 188-189. Abstract. Exposed tissue transplanted to observe latent effects of radiation.

348. EUGSTER, J.: Ueber den Nachweis von schweren Primären der kosmischen Strahlung mittels einer Farbstoffmethode [Demonstration of heavy primaries of cosmic radiation by means of a dye] *Astronautica Acta* 1955, 1: 57-60.

349. EUGSTER, J.: *Weltraumstrahlung.* Bern, Huber [1955] 141 pp.

350. SCHAEFER, H. J.: Biological significance of the natural background of ionizing radiation; observations at sea level and at extreme altitude. *J. Aviat. M.* 1955, 26: 453-462.

351. SCHAEFER, H. J.: Graphs and tables for the hit frequencies from heavy nuclei of the primary cosmic radiation. III. Statistical variation of hit frequencies in a population of exposed specimens. iv, 14, 4 pp. (U.S. Naval School of Aviation Medicine, Pensacola, Florida. Research report No. NM 001.101.100.10, 11 Fe. 1955).

352. SCHAEFER, H. J.: Graphs and tables for the hit frequencies from heavy nuclei of the primary cosmic radiation. IV. Iso-intensity charts for high-energy heavy nuclei within a standard sphere (man). iii, 17, 11 pp. (U.S. Naval School of Aviation Medicine, Pensacola, Florida. Research project No. NM 001.101.100 report No. 11, 20 Dec. 1955).

353. SCHAEFER, H. J.: Protection of humans from heavy nuclei of cosmic radiation in regions outside the atmosphere. *Astronautica Acta* 1955, 1: 100-109.

1954

354. BIRGE, A. C.: Laboratory studies for evaluating the biological effects of primary cosmic radiation. *J. Aviat. M.* 1954, 25: 326-330.

355. CAMPBELL, B.: A biological study of the effects of the heavy particle component of cosmic rays. *J. Aviat. M.* 1954, 25: 361-365.

356. CHASE, H. B.: Cutaneous effects of primary cosmic radiation. *J. Aviat. M.* 1954, 25: 388-391, 427.

357. HAIG, T. O.: Plastic balloons for high altitude research. *J. Aviat. M.* 1954, 25: 351-353.

358. KREBS, A. T.: Techniques of biological measurements of low level radiation. *J. Aviat. M.* 1954, 25: 331-337, 353.

359. SCHAEFER, H. J.: The cross section for thin-down hits from heavy nuclei of the primary cosmic radiation in biological experimentation. 17 [6] pp. (U.S. Naval School of Aviation Medicine, Pensacola, Florida. Research report, No. NM 001.059.13.07, 12 January 1954).

360. SCHAEFER, H. J.: Definition of a permissible dose for primary cosmic radiation. *J. Aviat. M.* 1954, 25: 392-398, 411.

361. SCHAEFER, H. J.: Graphs and tables for the hit frequencies from heavy nuclei of the primary cosmic radiation. I. Hit frequencies for small specimens (drosophila, plant seeds, etc.) 9 [3] pp. (U.S. Naval School of Aviation Medicine, Pensacola, Florida. Research report, No. NM 001.059.13.08, 10 June 1954).

362. SCHAEFER, H. J.: Graphs and tables for the hit frequencies from heavy nuclei of the primary cosmic radiation. II. Hit frequencies for spherical targets of 2 to 5 centimeter diameter (small mammals). 6 [4] pp. (U.S. Naval School of Aviation Medicine, Pensacola, Florida. Research report, No. NM 001.059.13.09, 4 August 1954).

363. SIMONS, D. G.: Methods and results of one year of balloon flights with biological specimens. *J. Aviat. M.* 1954, 25: 380-387.

364. SIMONS, D. G.: Stratosphere balloon techniques for exposing living specimens to primary cosmic ray particles. v, 67 pp. (U.S. Holloman Air Development Center. HADC-TR-54-16, November 1954).

365. STORER, J. B., and others.: Specific ionization and relative biological effectiveness of ionizing radiations in mammalian systems: application to problem of cosmic ray hazards. *J. Aviat. M.* 1954, 25: 368-377.

366. YAGODA, H., and SMITH, H. B.: Observations on the penetration of a heavy primary through tissue. *J. Aviat. M.* 1954, 25: 46-49, 66.

1953

367. EUGSTER, J.: Methods for demonstrating the biological effectiveness of cosmic radiation at high altitudes. *J. Aviat. M.* 1953, 24: 222-226. Biologic samples tested at 30,000 meters.

368. EUGSTER, J.: Zur Untersuchungstechnik der Erforschung der biologischen Wirkung der kosmischen Strahlung in grossen Hohen [Research technic for the investigation of the biological effect of cosmic radiation at high altitudes] In: *Space flight problems;* being a complete collection of all lectures held at the Fourth Astronautical Congress, Zurich 1953. Biel, Laubscher [1953] pp. 203-205.

369. GASPA, P.: Les rayons cosmiques: effets physio-pathologiques sur l'homme [Cosmic rays: physio-pathological effects on man. *Météorologie* 1953: No. 32, Oct-Dec., pp. 261-271.

370. SCHAEFER, H. J.: Cosmic radiation; an evaluation of present day knowledge of cosmic radiation at extreme altitude in terms of the hazard to health. *Pacific Rocket Soc. Bull.* 1953, 6: Sect. B. pp. 1-6 (No. 1, Jan. 10); Sect. B. pp. 1-5 (No. 2, Feb. 10); Sect. B. pp. 1-6 (No. 3, Mar. 10); Sect. B. pp. 1-8 (No. 4, April 10).

371. [SCHAEFER, H. J.] Space travel menace. *Sci. News Letter* 1953, 63: 323. Cosmic rays.

372. SCHAEFER, H. J.: Theory of protection of man in the region of the primary cosmic radiation. *J. Aviat. M.* 1954, 25: 338-350. Revision of: Theory of protection of man in the region of the primary cosmic radiation. U.S. Naval School of Aviation Medicine, Pensacola, Fla. (Project No. NM 001.059.13.06, 5 August 1953).

373. SCHAEFER, H. J., and STUHLINGER, E.: The rate of energy loss (REL) in the terminal section of heavy nuclei tracks in living tissue. 10 [7] pp. (U.S. Naval School of Aviation Medicine, Pensacola, Florida. Project No. NM 001.059.13.05, 11 March 1953).

374. SHEPHERD, L. R.: The possibility of cosmic-ray hazards in high altitude and space flight. *J. Brit. Interpl. Soc.* 1953, 12: 197-212. Also in: CARTER, L. J. (editor): *Realities of space travel.* London, Putnam, 1957. pp. 231-250.

1952

375. EUGSTER, J.: Die biologische Wirkung der kosmischen Strahlung; Methoden und neueste Ergebnisse [Biological effect of cosmic radiation, methods and most recent results] In: KÖLLE, H. H. (editor): *Probleme aus der astronautischen Grundlagenforschung.* (Vorträge gehalten anlässlich des III Internationalen Astronautischen Kongresses in Stuttgart, vom 1 bis 6 September 1952). Stuttgart, Gesellschaft für Weltraumforschung, 1952. pp. 211-[18].

376. EUGSTER, J.: Methode zum Nachweis der biologischen Wirkung der kosmischen Strahlung in grossen Höhen [Methods for demonstrating the biological effect of cosmic radiation at high altitudes] *Weltraumfahrt,* 1952, 3: 42-46.

377. GASPA, P.: Les rayons cosmiques et leur effets biologiques sur l'aviateur [Cosmic rays and their biological effects on aviators] *Méd. aéronaut.* 1952, 7: 187-194.

378. SCHAEFER, H. J.: Exposure hazard from cosmic radiation at extreme altitude and in free space. In: KÖLLE, H. H. (editor): *Probleme aus der astronautischen Grundlagenforschung* (Vorträge gehalten anlässlich des III Internationalen Astronautischen Kongresses in Stuttgart, vom 1 bis 6 September 1952). Stuttgart, Gesellschaft für Weltraumforschung, 1952. pp. 201-210. Also: *J. Amer. Rocket Soc.,* 1952, 22: 277-283.

379. SCHAEFER, H. J.: The radial spread of the tissue ionization in heavy nuclei tracks of the primary radiation. 10 [9] pp. (U.S. Naval School of Aviation Medicine, Pensacola, Florida. Project No. NM 001.059.13.04, 5 August 1952).

380. SCHAEFER, H. J.: Exposure hazards from cosmic radiation beyond the stratosphere and in free space. 9 pp. (U.S. Naval School of Aviation Medicine, Pensacola, Fla. Proj. No. NM 001.059.13.03, 31 March 1952). (Also with a different conclusion and the addition of graphs): *J. Aviat. M.* 1952, 23: 334-344, 401.

381. TOBIAS, C. A.: Radiation hazards in high altitude aviation. vii, 36 pp. (USAF Wright Development Center. WADC Technical report 52-119, May 1952). Also (with minor variations) *J. Aviat. M.* 1952, 23: 345-372.

1951

382. BUETTNER, K.: Radiation effects on man in space. *Bull. Amer. Met. Soc.* 1951, 32: 183-185. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 13).

383. SCHAEFER, H. J.: The diurnal intensity variation of the primaries of cosmic radiation and its consequences for the hazard to health in flight at extreme altitudes. *J. Aviat. M.* 1951, 22: 351-357. To 140,000 ft.

384. SCHAEFER, H. J.: Further evaluation of cosmic radiation in terms of hazards to health. 20, [3] pp. (U.S. Naval School of Aviation Medicine, Pensacola, Fla. Project No. NM 001.059.13.02, 15 August 1951). "This report summarizes all data on the heavy nuclei component which have appeared in the literature between Jan. and Dec. 1950."

1950

385. KREBS, A. T.: The possibility of biological effects of cosmic rays in high altitudes, stratosphere and space. 21 pp. (U.S. Army Medical Dept. Field Research Laboratory. MDFRL Project No. 6-64-12-08-(7), 28 April 1950). Also: *J. Aviat. M.* 1950, 21: 481-494.

386. SCHAEFER, H. J.: Evaluation of present day knowledge of cosmic radiation at extreme altitude in terms of the hazard to health. *J. Aviat. M.* 1950, 21: 375-394, 418. Also: U.S. Naval School of Aviation Medicine, Pensacola, Fla. Project NM 001.059.13.01. April 30, 1950.

NUTRITION IN SPACE FLIGHT

1958

387. ADAMS, C. C.: Nutrition in space flight. *Missiles and Rockets* 1957, 2: 105-107. Italian translation: *Riv. aeronaut.* 1958, 34: 1027-1032.

388. Feeding men during space flights; contributions to the session on space feeding... eighteenth annual meeting of the Institute of food technologists, Chicago, May 28, 1958. *Food Technology,* 1958, 12: 429-463. Contents: HANSON, S. W. F.: Some observations on the problems of space feeding, pp. 430-432; GAUME, J. C.: Nutrition in space operations, pp. 433-435; SIMONS, D. G.: Nutrition in space flight, balloon flight experience, p. 436-441; TAYLOR, A. A.: Present capabilities and future needs for space feeding; pp. 442-444; FINKELSTEIN, B.: Feeding crews in air vehicles of the future, pp. 445-448; BROCKMAN, M. C., and others: Closed cycle biological systems for space feeding, I. Systems 1 and 2. [II. System 3] pp. 449-458; HOSGSON, J. G. and TISCHER, R. G.: Space feeding problems: a bibliography, pp. 459-463. Also issued as a 36-page separate by the Institute.

1957

389. KOOISTRA, J. A., Jr., and HARRIS, N. O.: Metabolic studies with lactobacillus under certain space flight conditions. 4 leaves. (U.S. School of Aviation Medicine, Randolph AFB. [Report] 58-39, December 1957).

SURVIVAL PROBLEMS

1958

390. REICH, H.: Laboratory for space research. *Astronautics* 1958, 3: 37-38, 78-79. Report on high-vacuum chamber and full-pressure suit research.

391. Space age research on Mt. Evans, Colorado. *Med. Tech. Bull.* 1958, 9: 185-190. On acclimatization to altitude and other physical requirements for the spaceman. Dr. BRUNO BALKE was in charge of the research.

1956

392. BEISCHER, D. E., and BORN, S.: The "boiling" phenomenon of living tissue at low atmospheric pressure. ii, 12 pp. (U. S. Naval School of Aviation Medicine, Pensacola, Florida. Research project No. NM 001.103.100 report No. 1, 9 July 1956). Also: J. Aviat. M. 1957, 28: 154-160.

393. WARD, J. E.: The true nature of the boiling of body fluids in space. *J. Aviat. M.* 1956, 27; 429-439. Also in: USAF School of Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 33).

1955

394. HITCHCOCK, F. A., and KEMPH, J.: The boiling of body liquids at extremely high altitudes. *J. Aviat. M.* 1955, 26: 289-297.

395. JEFFRIES, M. R. H.: Elements of space-suit design. *J. Camb. Univ. Interpl. Soc.* 1955, 1: 25-27 (Je.).

396. PAUL, M. C.: A method of sealing and gas-conditioning an orbital survival suit. *J. Brit. Interpl. Soc.* 1955, 14: 300-306.

1954

397. BLOCKLEY, W. V., and others.: Human tolerance for high temperature aircraft environments. *J. Aviat. M.* 1954, 25: 515-522.

398. LOEB, M., and others.: A preliminary investigation of the effects of whole-body vibration and noise. i, 17, 11 pp. (U. S. Army Medical Research Laboratory, Fort Knox, Ky. Report No. 145, 12 November 1954).

399. University of Michigan. Engineering Research Institute. Reference sources in the physiology of extreme environmental temperatures. By W. H. FENNINGS and others. iii, 59 pp. (Engineering Research Institute project 2167-2-P, May 1954). (Department of the Army contract No. DA-20-018-ORD-13146).

400. WEISS, H. H.: The physiology of simple tumbling. Part 2. Human studies. v, 20 pp. (USAF Wright Air Development Center. WADC technical report 53-139, Ja. 1954).

1953

401. HABER, F.: Escape and survival at high altitude. iii, 11 pp. (USAF School of Aviation Medicine, Randolph Field, Texas. Project No. 21-1207-0006, September 1953). Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 7).

402. HABER, F., and CLAMANN, H. G.: Physics and engineering of rapid decompression. A general theory of rapid decompression. 29 pp. (USAF School of Aviation Medicine, Randolph Field, Texas. Project No. 21-1201-0008, Report No. 3, August 1953). Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 6).

1952

403. HABER, F.: Bailout at very high altitudes. *J. Aviat. M.* 1952, 23: 322-329. 200,000-400,000 ft. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 19).

404. HABER, F., and STRUGHOLD, H.: Physik und Physiologie des Drucksturzes im weltraum [Physics and physiology of explosive decompression in space]. *Weltraumfahrt* 1952, 3: 118-120.

1950

405. HABER, F.: On the physical process of explosive decompression. 7 pp. (USAF School of Aviation Medicine, Randolph Field, Texas. October 1950). Special report. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 1).

406. ROSS, H. E.: Lunar spacesuit. *J. Brit. Interpl. Soc.* 1950, 9: 23-37. See also letters regarding this article. *Ibid:* 258-259, 300-302.

PSYCHOLOGIC AND SOCIAL PROBLEMS

1958

407. BURROWS, A: Psychological stress in space travel. *New Scientist,* 1958, 3: pp. 12-14 (No. 75, 24 Ap.)

408. CLARK, E.: USAF simulates space crew conditions. *Aviat. Week* 1958, 68: pp. 51, 53, 55, 57, 59, 63 (No. 18, May 5). Wright Air Development Center confinement studies described.

409. HENRY, J. P.: Psycho-physiological hazards of satellite flight. In: Royal College of Aeronautics, London. *High altitude and satellite rockets;* a symposium held at Cranfield, England, 18th-20th July 1957. Published jointly by the Royal Aeronautical Society [and] the British Interplanetary Society. London, 1958. pp. 107-110, and *Joint discussion* pp. 111-114.

410. MICHAEL, D. N.: How to keep space crews content. *Missiles and Rockets* 1958, 3: 110, 112-114 (No. 4, Ap.).

411. New York Academy of Sciences. Man in space: a tool and program for the study of social change. *Ann. N. York Acad. Sc.* 1958, 72: 165-214. Especially: LASSWELL, H. D. Men in space, pp. 180-194, Selection and training of personnel, pp. 181-188.

412. SELLS, S. B., and BERRY, C. A.: Human requirements for space travel. 30 [1] pp. Randolph AFB, Texas, School of Aviation Medicine, 9 Fe., 1958.

413. Work helps man endure space isolation. *Aviat. Week,* 1958 68: pp. 37, 39, 43, 45, 47 (No. 11, Mar. 17). Research at School of Aviation Medicine and Wright Air Development Center described.

1957

414. BEYER, D. H., and SELLS, S. B.: Selection and training of personnel for space flight. *J. Aviat. M.* 1957, 28: 1-6. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 35).

415. WILCOX, E. J.: Psychological consequences of space travel. *J. Brit. Interpl. Soc.* 1957, 16: 7-10. See also the following letters to the editor regarding this article: BRODNEY, P. J., Sociological aspects of space travel; and SLATER, E. T. O., Psychological consequences of space travel. *Ibid:* 173-176.

1950

416. AMICO, G. V.: Preface to space flight: synthetic training. U. S. Office of Naval Research. *Research Reviews* 1955, Nov. pp. 15-20.

417. SLATER, E. T. O.: Psychological problems of space flight. *J. Brit. Interpl. Soc.* 1950, 9: 14-18 (Jan.).

GROUND CREW PROBLEMS

1958

418. KROP, S.: Medical problems in handling of rocket fuels. In: Aviation Medicine symposium, United States Air Force Aviation Medicine Residency Program, Toxic hazards in military flying and in the aviation industry, 6-7 November 1957, Headquarters, Air Materiel Command, Wright-Patterson, AFB, Ohio. pp. 41-44.

419. SCHECTER, W. H.: Toxicity of high-energy fuels poses hazards for handlers. *Missiles and Rockets* 1958, 3: 85-86 (No. 4, Ap.). On toxicity of boranes.

420. STUMPE, A. R.: Health hazards of new aircraft and rocket propellants; a review of the literature. *J. Aviat. M.* 1958, 29: 650-659.

1957

421. U. S. Department of the Army. Health hazards from propellant fuels and oxidizers. 12 pp. (TB Med 242, Nav. Med. P-5035, AFP 160-6-3, 21 June 1954). Change 1, 26 Fe. 1957. 3 pp. [Hydrazine and UDMH].

1954

422. KROP, S.: The toxicity and health hazards of rocket propellants. *Jet Prop.* 1954, 24: 223-227, 236.

1952

423. OWSTON, J.: Rocket propellants: their toxic effects, hazards and first aid. *J. Roy. Army M. Corps* 1952, 98: 157-169.

EXTRATERRESTRIAL ASPECTS

1958

424. STRUGHOLD, H.: "Geographie" des Weltenraumes: Spatiographie. *Weltraumfahrt* 1958, 9: 65-68.

425. WHITE, M. S.: The aeromedical realities of space travel. *J. Aviat. M.* 1958, 29: 707-715.

1957

426. STRUGHOLD, H.: The ecosphere in the solar planetary system. In: Proceedings of the VIIth International Astronautical Congress (Rome 17-22 Sept. 1956). Rome, Associazione Italiana Razzi 1956, pp. 277-288. In Italian: *Riv. med. aeronaut.* 1957, 20: 3-16 (Suppl. to No. 1, Jan.-Mar.).

1956

427. STRUGHOLD, H.: The oxygen belt in the planetary system. *J. Astronautics* 1956, 3: 27-28, 52. Also in USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 30).

1955

428. STRUGHOLD, H.: The ecosphere of the sun. *J. Aviat. M.* 1955, 26: 323-328. Also In: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 27).

429. TIKHOV, G. A.: Is life possible on other planets? *J. Brit. Astronomical Assoc.* 1955, 65: 193-204.

1954

430. JONES, H. S.: *Life on other worlds.* 2d ed. rev. New York, Macmillan, 1954. 259 pp.

431. RICHARDSON, R. S.: *Man and the planets.* London, Muller, 1954. 188 pp.

1953

432. STRUGHOLD, H.: Comparative ecological study of the chemistry of the planetary atmospheres. *J. Aviat. M.* 1953, 24: 393-399, 464. Also (with minor omissions and variations): USAF School of Aviation Medicine, Randolph Field, Texas. Special Report, December 1953. iii, 6 pp. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 8).

433. STRUGHOLD, H.: Das Leben auf dem Mars [Life on Mars] *Weltraumfahrt* 1953, 4: 24-26.

434. STRUGHOLD, H.: The green and red planet; a physiological study of the possibility of life on Mars. Albuquerque, Univ. of New Mexico, [1953] xvii, 107 pp.

435. TIKHOV, G. A.: Astrobiologiya. Moscow, 1953. 68 pp.

1952

436. STRUGHOLD, H.: Ecological aspect of planetary atmospheres, with special reference to Mars. *J. Aviat. M.* 1952, 23: 130-140. Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 17).

437. TIKHOV, G. A.: Astrobiologiya. *Tekhnika-Molodezhi* 1952, 20: 23-27 (No. 11, Nov.).

1951

438. STRUGHOLD, H.: Life on Mars in view of physiological principles. 8 pp. (USAF School of Aviation Medicine, Randolph Field, Texas. Special report, March 1951). Also: *Tech. Data Dig.* 1951, 16: 15-19 (Nov.). Also in: USAF School of Aviation Medicine, Randolph AFB, Texas. *Epitome of space medicine* (Item 3).

439. TIKHOV, G. A.: Novaya nauka, astrobiologiya [New science-astrobiology] *Nauka i Zhizn'* 1951, 18: 15-18. (No. 11, Nov.).

1950

440. NYE, E. R.: The possibility of potentially pathogenic organisms occurring on another planet. *J. Brit. Interpl. Soc.* 1950, 9: 62-63. See also letter taking issue with Nye: *Ibid:* 254-255; and Nye's reply: *Ibid:* p. 302.

1932

441. SCHACHNER, N.: Can man exist on other planets? *Bull. Amer. Interpl. Soc.* 1932, No. 15, Ja. pp. 3-10.

OTHER BIBLIOGRAPHIES

1958

442. BENDIG, A. W.: *Supplemental bibliography on space medicine.* 6 leaves. Pittsburgh, Dept. of Psychology, Univ. of Pittsburgh, Sept. 15, 1958. 63 references, mainly on behavioral effects of acceleration and deceleration.

443. BENTON, M.: Earth satellites, guided missiles, rockets and space flight; a bibliography of books and periodical articles. *Wilson Library Bull.* 1958, 32: 412-419. No specifically medical references listed.

444. HENDRICKSON, R. M.: *Bibliography on space medicine.* Los Alamos, Los Alamos Scientific Laboratory Libraries, 1958. 261 typewritten references on single sheets assembled in a spiral binding.

Author states: "References consulted: Index Medicus, 1940-June 1955, Current List of Medical Literature, July 1955-1957."

445. U. S. Army Library: *Military aspects of space exploration;* a selected list of titles. iv, 55 pp. (Its: Special bibliography No. 16, 5 June 1958). Environmental factors and problems pp. 34-42.

1954

446. KOELLE, H. H., and KAEPPELER, H. J. (editors): *Literaturverzeichnis der Astronautik.* [Literature-Index of Astronautics] Tittmoning, Walter Pustet [1954] 100 pp. Physiologie p. 44; Medizin, p. 44-47.

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THE PHYSICIAN IN A TROUBLED WORLD

Perhaps the most deadly form of conformity, as applied to doctors, is the widespread belief that a man of medicine must be isolated from the affairs of the world. Medicine must always deal not simply with disease but with the whole man in relationship to society, for man cannot long remain healthy in an unhealthy society. The great men of medicine have all been outstanding as intellectuals, as philosphers, or in other ways; one needs only to read the writings of Sir William Osler and Oliver Wendell Holmes to realize this truth once again. Even Rudolf Virchow, father of cellular pathology, left his microscope long enough to write; "People must feel that they belong together, not on account of a common ancestry, which they perhaps do not have . . . but on account of a spirit in which they live together." What better credo could be laid down in these troubled times when the nations of the world must stand together for peace, or fall separately into oblivion?—Frank G. Slaughter: The Danger of Agreeing. *The Journal of the Florida Medical Association*, December 1958.

494610 O - 59 - 7

Clinicopathologic Conference

Fitzsimons Army Hospital,
Denver, Colorado*

CHEST PAIN

Summary of Clinical History. A 22-year-old man was admitted to this hospital by transfer from Germany complaining of pain in the right lateral part of his thorax, radiating posteriorly and inferiorly.

The patient had been in good health until three months earlier when he experienced a sudden onset of pain in the right lower lateral part of his chest which radiated through to the back and downward. Onset occurred while at rest and was unassociated with trauma or excessive exertion. The pain was made worse by deep or forceful respiration, but was somewhat relieved by sitting up and bending forward. The patient felt feverish at the onset but did not have a chill. Cough, sputum, hemoptysis, dyspnea, and gastrointestinal and urinary complaints were absent. He was unaware of substernal compression, pain in his arms, or palpitation. After outpatient treatment for six days had yielded no improvement, he was admitted to a hospital where a roentgenogram of the chest suggested right-sided pleural effusion with a fluid level at the seventh rib posteriorly, and slight left displacement of the mediastinum. Expectant treatment failed to produce significant improvement. Three weeks later a repeat chest film showed the entire right lower lung field to be obscured by fluid and thickened pleura, which appeared limited by the horizontal fissure. 1,000 ml of thick, blood-tinged, cloudy, brown fluid with fibrin clots were removed from the right side of the chest without difficulty and 60 ml of air were injected. A roentgenogram which followed was reported to show an air and fluid level in the right lower lung field, bounded superiorly by dense pleural thickening and com-

*At the time of this conference, Maj. Gen. Martin E. Griffin was Commanding Officer. From the Pathology Service, Col. Howard A. Van Auken, MC, USA, Chief.

pressed lung tissue suggesting a walled-off effusion not communicating with the overlying lung. While hospitalized overseas, the patient's symptoms changed but little, except that he appeared chronically ill, toxic, and apathetic, and lost 32 pounds in weight. Fever was mild but continuous, varying from 98.6 to 100.2 degrees.

At the time of transfer a systemic review disclosed no additional information.

Past history included the usual childhood illnesses. One year prior to the onset of the present illness he was treated for chancroid in Germany. Incision and drainage of inguinal lymph nodes was performed and sulfonamide therapy was instituted, resulting in prompt healing without sequelae. There had been no further illnesses, injuries, or operations.

The patient's immediate family was alive and well. The patient knew of no contacts with tuberculosis. Familial diseases were specifically denied. He was a native of Alabama and had lived most of his life on a farm. He enlisted in the Service at age 18 and had served continuously since, with duty at a number of stations in the southeastern United States, California, the Far East, and Europe.

Physical Examination. On admission the patient appeared to be chronically ill, debilitated, and toxic. His temperature was 101° F; pulse rate, 90 per minute; respirations, 25; and his blood pressure was 110/70 mm Hg. There was moderate pallor of the conjunctivas and nail beds. The head and neck were essentially negative. There was no palpable lymphadenopathy. There was respiratory lag to expansion over the right lower part of the thorax. No tactile fremitus was elicited in this region. The percussion note was dull up to the level of the sixth vertebra posteriorly on the right and to the fourth interspace anteriorly. Breath sounds were diminished over this area, and there were scattered inspiratory and post-tussive rales. The heart was not enlarged and no mediastinal displacement was suggested. The abdomen was full and soft, but slightly distended. A smooth liver margin was questionably palpable at the costal margin. There was vague, ill-defined abdominal tenderness, particularly in the right upper and lower quadrants. Bowel sounds were hyperactive but of normal quality. Rectal, genital, and neurologic examination findings were normal.

Laboratory Studies. The red blood cell count ranged from 3,300,000 to 4,100,000 per μl, and the hemoglobin varied from 9.5 to 10.2 grams per 100 ml. There was no sickling, and the red cell morphology showed slight hypochromia. The white blood cell count ranged from 11,000 to 13,000 per μl, with an average differential of 70 per cent neutrophils, 25 per cent lymphocytes, 3 per cent monocytes, and 2 per cent eosinophils. Platelets were adequate and no abnormal cells were found. Repeated urinalyses

were negative. Bacteriologic examinations of sputums, gastric washings, and pleural fluid were negative for acid-fast and other pathogenic organisms. Papanicolaou smears of sputum and pleural fluid were negative for tumor cells. Pleural fluid smear showed 73 lymphocytes and 27 neutrophils; no organisms were seen. The serologic test for syphilis was negative. Nonprotein nitrogen was 48 mg per 100 ml; carbon dioxide, 32 mEq per liter; total protein, 5.1 grams (albumin 2.2 grams, globulin 2.9 grams) per 100 ml. The total bilirubin was 1.3 mg per 100 ml, with a direct bilirubin of 0.7 mg per 100 ml. Prothrombin concentration was 80 per cent of normal. Agglutination studies showed a titer of 1:80 for typhoid O, 1:20 for typhoid H, 1:40 for paratyphoid, negative tests for brucella and tularemia, and a negative Weil-Felix reaction. A tuberculin skin test with PPD (first strength) gave a 2 plus reaction; coccidioidin and histoplasmin skin tests (1:1000) were negative. An electrocardiogram was interpreted as normal.

Course in Hospital. Following admission and initial therapy, repeat roentgenograms of the chest showed a slight decrease in pleural reaction. The right diaphragm was described as elevated to the level of the ninth rib with an overlying linear density interpreted as a focus of discoid atelectasis. The mediastinum was in midline. With exacerbation of symptoms described below, there was marked increase in the extent of density over the right lung base with the upper limit at the sixth interspace posteriorly. Small air pockets were noted in the superior portion of this density. The heart and mediastinum once more had shifted to the left. The visible lung fields remained clear. A flat film of the abdomen late in the patient's hospitalization suggested adynamic ileus. A skeletal survey, intravenous pyelogram, and upper gastrointestinal series, obtained early in the patient's course in the hospital, were negative. (Latter films are not available.)

Bronchoscopy showed slight deviation to the right without focal extrinsic pressure or compression. In the right lower lobe, the bronchus was moderately inflamed and contained small amounts of mucopurulent exudate. No masses or focal lesions were seen. Following admission, daily thoracentesis yielded fluid similar to that noted previously. The volume obtained decreased steadily from a liter daily to 100 ml. The character changed from viscid proteinaceous fluid with fibrin clots to thin, clear, serous exudate. Over the first three weeks with forced feeding there was marked improvement with subsidence of daily fever and weight gain. For one week the patient was able to get out of bed occasionally, but shortly thereafter a recrudescence of fever and pain occurred and fluid reaccumulated in increasing volume in the right pleura, requiring thoracentesis yielding up to 1,000 ml of fluid daily. The fluid once more became thick and cloudy with numerous fibrin clots. Repeated blood transfusions failed to sustain the blood indices, and no improvement in total protein levels re-

sulted from administration of albumin and protein hydrolysate. Epigastric distention with hiccup, belching, and excessive flatus were troublesome. A short episode of diarrhea was controlled promptly with paregoric. A septic fever up to 103°F. daily occurred over the terminal three weeks of illness and the course was one of progressive deterioration. Clubbing of the fingers became apparent during the latter part of the patient's illness. During the last two weeks of his life he developed a cough productive of purulent, greenish-yellow sputum. At this time breath sounds became tubular and tactile fremitus was elicited over the right lower lobe. Whispered pectoriloquey was present and there were numerous inspiratory and expiratory rales. Throughout hospitalization the patient received penicillin, sulfonamides, and streptomycin sulfate without improvement. Death occurred quietly during the third month following transfer.

DISCUSSION

Doctor Phelps:* I do not believe this case is primarily a chest problem. I would like, first, to review the points in the protocol that I believe are important.

The patient was stationed in the Far East, Europe, the southeastern part of the United States, and California, which means that he has been in almost all areas where many of the commoner chest conditions originate. He had pain in the right lateral part of his chest, radiating through to the back and downward, which could be the result of disease in the chest or abdomen. The pain was made worse on deep inspiration and relieved by sitting up and bending over. This may be due to an abdominal lesion and is especially suggested by the latter. He had no cough, dyspnea, hemoptysis, or gastrointestinal or urinary complaints. He was chronically ill, toxic, apathetic, and had lost 32 pounds in weight. He has a mild but continuous elevation in temperature. He did not have chills.

There was respiratory lag over the right thorax, absent fremitus, and dullness to percussion. There was slight liver enlargement and ill-defined abdominal tenderness, especially in the right upper and lower quadrants. Rectal examination was negative, and I presume that this was adequately done so as to rule out appendiceal abscess or acute inflammatory process in the right lower quadrant.

Laboratory data revealed a 3,300,000 to 4,100,000 red cell count and the hemoglobin varied from 9.5 to 10.2 grams per 100 ml. This could go along with almost any kind of debilitating disease. White blood cells numbered 11,000 to 13,000 per μl, which would be considered only a slight elevation considering the degree of disease the individual had if it was an infection. He had a differential count of 70 per cent neutrophils, 25 per cent lymphocytes, 3 per cent monocytes, and 2 per

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cent eosinophils. This is almost normal. The 2 per cent eosinophils would be inconsistent with echinococcal disease. He had innumerable bacteriologic examinations, all of which were negative. This, I think, is very significant, particularly since thick purulent material was aspirated from the pleural space. Certainly, if this were a bacterial infection, it should have been fairly easy to distinguish by culture and smear. His A/G ratio was inverted, which would go along with almost any debilitating disease. Liver function studies were almost normal.

Bronchoscopy showed some mucopurulent exudate in the bronchial tree of the right lower lobe but was otherwise normal. Thoracentesis was performed almost daily, and the pleural fluid was almost the same as at first, being thick, brown material. However, after the patient had been on strict bed rest, the fluid became clear and serous. When he was again allowed to be ambulatory, the material again became thick and purulent, and he showed signs of reactivity of the disease. He developed hiccups, which were fairly persistent and would be caused by any kind of irritation of the diaphragm in that area. He had a septic course terminally, running a temperature of 102°F. He had clubbing of his fingers. Clubbing is most frequently seen in either carcinoma or an empyema, and certainly after the patient's first tap, he had an empyema. He had a productive cough of purulent, yellow sputum, which persisted in spite of penicillin, sulfonamides, and streptomycin sulfate, none of which apparently improved his condition.

I think the revealing clue in this case is the nature of the fluid which came from the pleural space. It is said to have been thick, brown, cloudy, and was negative on smears and culture. This would very well fit an amebic infection, as do the other features of the case. Amebic abscess of the liver is characterized by chronic illness with gradual and progressive weight loss, low-grade fever with rare chills, pain in the right upper quadrant, and, if the diaphragm is involved, there is pain on respiration. There may be signs of consolidation of the right lower lobe, with or without pleural effusion. This often leads to the erroneous diagnosis of pneumonia, empyema, or tuberculous pleurisy. The abscess frequently ruptures into the pleural space, involves the lung, and drains through the bronchus. The liver edge is palpable, and on pressure there is deep pain. This patient had a peculiar type of tenderness over the liver, and also dullness to percussion over the right lower lung field. The diaphragm usually is elevated when an abscess is superior and involves the diaphragm. The roentgenograms will be discussed later, but on reviewing them, I believe that the initial one reveals an elevation of the diaphragm, which was mistaken for a fluid level.

With multiple small abscesses, the white blood cell count usually is elevated. If the abscess is large, there usually is only slight elevation. If the abscess is larger, the white blood cell count usually is lower. This person had a relatively slight elevation of the white cell count. If this criterion is true, we would assume he had a fairly large abscess. The fluid of amebic abscess is thick, semifluid, chocolate brown in color, and frequently has fibrin clots and debris. Amebas are not

present in the necrotic contents of the cavity, and therefore cannot be demonstrated in the fluid. The organisms are found in large numbers in the advancing wall. The fluid usually is bacteriologically sterile. In very large abscesses, the fluid is yellowish. The larger the abscess, the more nearly the fluid becomes clear. This person was bringing up very large amounts of yellowish material through his bronchus. Possibly the abscess had involved his lung and was draining through the bronchus.

Treatment of amebic abscess consists of emetine or chloroquine, or both, with repeated closed needle drainage.[1] Open drainage has a higher mortality rate. This man had half the treatment, namely the drainage.

My diagnosis in this case is amebic abscess of the liver involving the diaphragm. After needle tapping, it involved the pleura, the lung, and eventually drained through the bronchus.

Doctor Maier:* In making the diagnosis of a subphrenic abscess from a radiologic viewpoint, there are two things we should recall. The first is that the diaphragm should be fixed and the second is a demonstration of an air fluid level below the diaphragm. The first roentgenogram, dated 5 August, shows a density in the lower right side of the chest. It has a straight superior border, not characteristic for a pleural effusion. Infrapulmonary effusions may be present in this fashion, apparently the original thought in this case. As we progress through several roentgenograms, we note that in the one dated 25 August (fig. 1) an obvious air fluid level is seen in this density. We must not immediately arrive at a diagnosis of subphrenic abscess, as this air might have been placed into an infrapulmonary effusion by a diagnostic or therapeutic thoracentesis. At this point, two procedures might prove helpful. The first would be fluoroscopy in an attempt to localize the diaphragm and check for fixation. A diagnostic pneumoperitoneum might aid the fluoroscopist considerably. Second a roentgenogram of the chest taken with the patient in a right lateral decubitus position may show shift of pleural fluid above the diaphragm. It is to be remembered that with subphrenic abscess we may have free pleural fluid in the form of a sympathetic effusion or an associated pulmonary inflammatory process.

If a subphrenic abscess occurs on the left side, we must distinguish this from the gastric air bubble. This can be simply done by having the patient swallow a barium meal.

In conclusion, because this patient definitely manifested symptoms and signs of having a subdiaphragmatic abscess, amebiasis deserves first consideration. The question of an infrapulmonary effusion cannot be entirely ruled out but, in future cases, the procedures discussed might prove helpful.

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*Capt. John G. Maier, Resident in Radiology.

Figure 1. Roentgenogram showing air fluid level.

Dr. Phelps' diagnosis:

1. Amebic abscess of liver with pleuropulmonary abscess following needle aspiration

Clinical diagnoses:

1. Abscess of the liver, chronic, cause undetermined.

2. Abscess, subdiaphragmatic, chronic, cause undetermined.

PATHOLOGIC FINDINGS

Doctor Howbert:* The significant autopsy findings were related to the liver, lungs, and intestines. The liver was enlarged (2,760 grams) but not distorted. In the posterior superior portion of the right lobe was a solitary 14-cm abscess containing semifluid, brownish-gray material. There was a fairly well defined fibrous wall, and the lining was shaggy and granular. The abscess was fused to the diaphragm, to which there was a jagged 1.5-cm perforation extending into the overlying pulmonary substance. The pleural pulmonary abscess was walled off by dense fibrosis and was surrounded by consolidated lung parenchyma. No bronchopleural fistula was demonstrated, and it is probable that the expectorated material was related to the pneumonitis.

In the terminal ileum, cecum, and ascending colon were discrete and confluent, jagged, undermining mucosal ulcerations. In addition, there was a patchy fibrinous exudate over the serosa of the involved bowel. In many places the wall was extremely friable and necrotic, and there was a greenish-yellow membrane which suggested staphylococcal enteritis, although we were not able to culture staphylococci from the bowel.

Microscopic examination of the colonic ulcers, the liver abscess wall, and the right lower lobe of the lung revealed morphologically typical *Endamoeba histolytica* trophozoites.

The present case is an excellent illustration of the pathogenesis and of some of the commoner clinical manifestations in amebiasis.[2-4] Amebiasis results from infection by the protozoan *Endamoeba histolytica,* which is an obligatory tissue parasite. Transmission is by ingestion of material contaminated with the cyst form. The trophozoites, if they are contaminants, are either destroyed rapidly by drying, or if they are ingested they are destroyed by the gastric juice. In the lower intestine the cysts break down, liberating trophozoites which invade the wall by means of proteolytic enzymes. Further extent of the infection is determined by the host-parasite relationship established. Thus, while numerous surveys show that about 10 per cent of the population of the United States harbor the parasite, only a small number, perhaps 10 per cent, develop clinical disease, which assumes various forms.

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*Capt. James P. Howbert, MC, Resident in Pathology.

When significant numbers of lesions are present in the sigmoid and rectum, dysentery occurs. The commoner site of localization in the bowel, however, is the cecum, which probably accounts for the low incidence of symptoms in affected persons. In the bowel, trophozoites invade blood vessels (fig. 2) and are disseminated to the various organs, the most common by far being the liver. As in our patient, direct extension through the diaphragm (fig. 3) from the liver abscess into the lung is not infrequent. Less common is involvement of the brain, spleen, and kidneys. Organisms have been reported in practically every structure of the body.

As has been emphasized, probably the most important factor in establishing the diagnosis is suspicion of the disease. Diagnostic tools include stool examination, culture, and serologic tests. The most frequently used and at present, the most reliable method is examination of fresh stools for cysts and trophozoites with typical morphology. If enemas are used to obtain stool specimens, oily enemas should be avoided. If stools are examined immediately, trophozoites may be found at times. If examination of the stool specimen is deferred for any period of time, it is best to store the specimen in the refrigerator, contrary to the often repeated advice to keep the specimen warm in an incubator. The latter procedure accelerates the breakdown of trophozoites, whereas refrigeration slows this process and allows examination to take place several hours after obtaining the specimen. After storage, the specimen is, of course, warmed to induce motility. Culture is a reliable method, although at times it is technically rather difficult, and in the usual case is not necessary. Considerable work is being carried on to develop serologic tests, but as yet none of these have been completely accepted or are completely satisfactory.

In summary, this case is one of an essentially asymptomatic amebic ileocolitis leading to liver abscess, with extension through the diaphragm and formation of a pleural pulmonary abscess. Whether this extension was spontaneous or followed needle tapping is not clearly established; however, the radiologic evidence certainly appears to favor the latter. The onset of symptoms apparently coincided with the involvement of the diaphragm. Death resulted from the debilitating affects of the amebiasis complicated terminally by pneumonitis and secondary bacterial infection of the bowel.

Pathologic diagnoses:

1. Abscess, right lobe of liver, caused by *Endamoeba histolytica*, with perforation of the diaphragm

2. Abscess, lower lobe of right lung, with organizing pneumonia, caused by *E. histolytica*

3. Colitis, ulcerative, *E. histolytica*

A physician: Why were no amebas found in the aspirated fluid?

Doctor Van Auken: As Major Phelps has already remarked, characteristically amebas are not found in the fluid of an amebic abscess but are seen in the wall around it. When an abscess is aspirated, the chocolate-brown color of the fluid will give an indication as to what

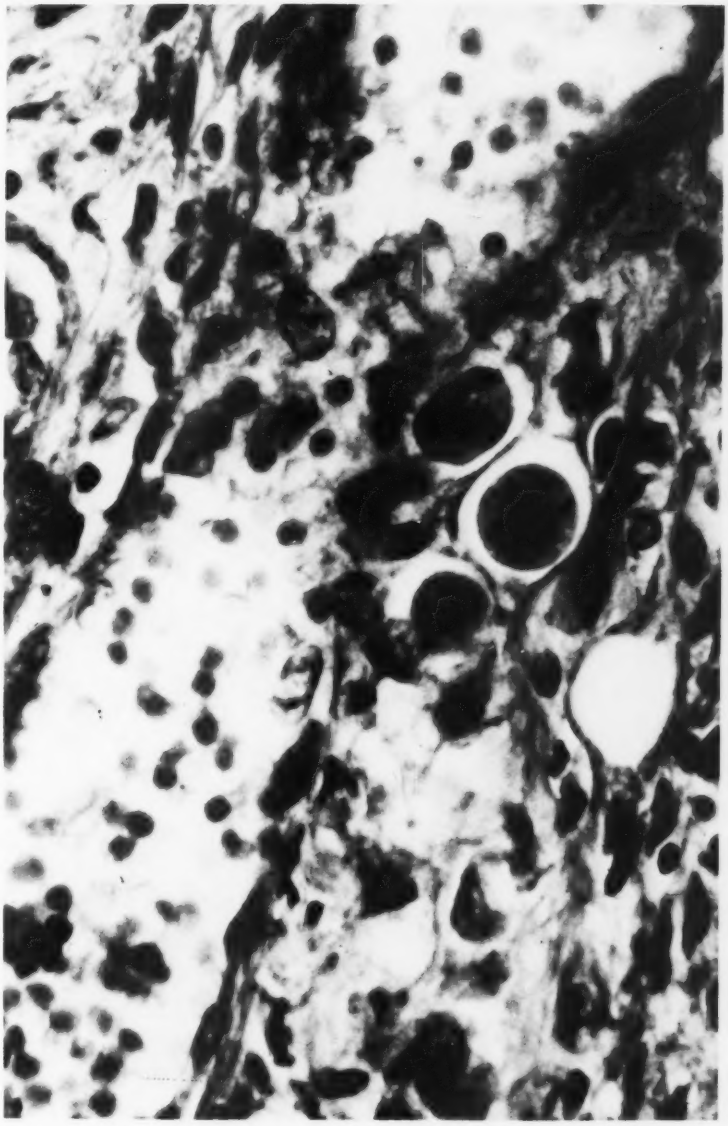

Figure 2. Photomicrograph of section of bowel wall, showing invasion of blood vessel by trophozoites. (Approximately × 750)

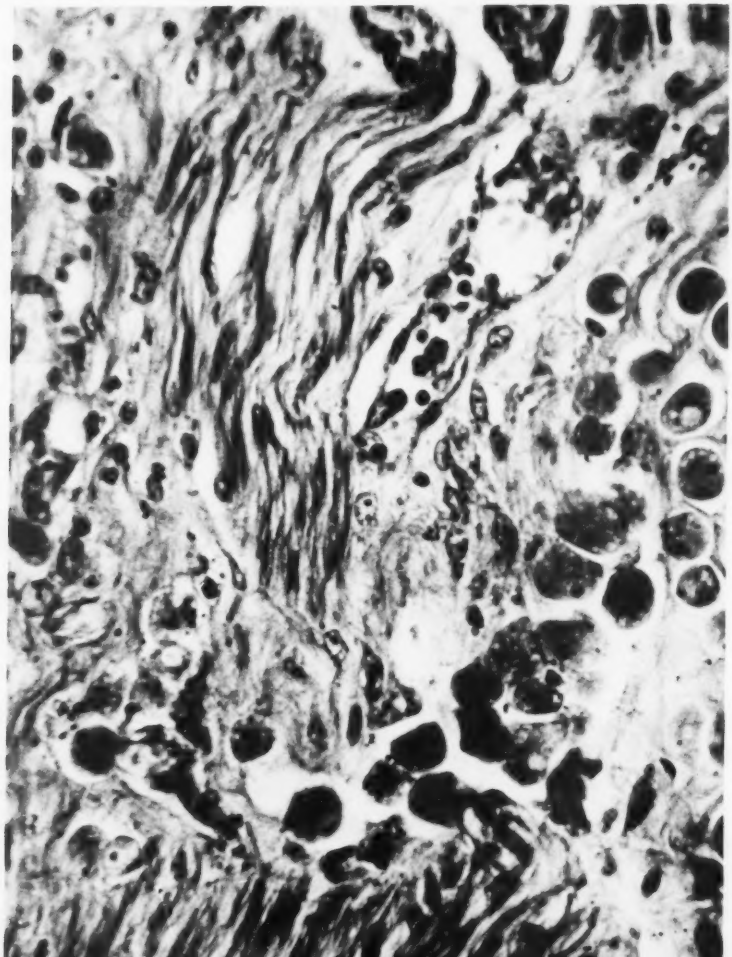

Figure 3. Photomicrograph of section of diaphragm being invaded by amebas. (Approximately × 400)

the disease process is. But, to actually locate the organisms the wall of the abscess is needed.

A physician: I would like to ask for a comment from Major Phelps as to how he explains the clubbing.

Doctor Phelps: I think that the clubbing apparently developed after he had been at this hospital and after his first needle aspiration. I am certain, that after the aspiration, he had an empyema which was draining the abscess into the pleural cavity and that the fairly extensive empyema must have produced the clubbing of the fingers.

Doctor Weir:* I would like to know if you have any information whether the thoracentesis was performed anteriorly, laterally, or posteriorly?

Doctor Howbert: A am sorry, but we do not have that information.

Doctor Weir: In this patient it was necessary to decide whether there was a liver abscess or a pleural effusion. Possibly in doing the tap, a subphrenic abscess, which could have been suspected prior to the procedure if the roentgenograms had been carefully examined, could have been inadvertently penetrated.

I would like to make another comment. Cases with amebic abscess rupturing into the lung have been diagnosed by sputum examination. At least two, in the limited number I have seen, did have amebas in the sputum when the patients started bringing up fairly typical sputum. However, at that time the diagnosis was strongly suspected, and we were looking for amebas in the sputum; I wonder if these could be overlooked if you were not specifically looking for them.

Doctor Van Auken: Amebas may be found in the sputum on occasion. I have known two or three cases where such findings led to the diagnosis. I suppose it would be possible to overlook amebas in the sputum, if only a few were present, but if you think about it and particularly if the sputum is dark red-brown and rusty, one might look more carefully. I think maybe Dr. Powell has something to say on this same subject.

Doctor Powell:* Examination of the sputum for ameba can be very rewarding after an amebic abscess has ruptured through the diaphragm and into the lung, which not uncommonly occurs in neglected cases. The sputum on such occasions is most characteristic. It is usually voluminous and has the typical anchovy-paste appearance, so often described of the aspirate from an abscess. Once one sees this material, one will never forget it—it is so typical. In such sputum, one will often find *Endamoeba histolytica.*

The treatment for amebic abscess of the liver is still somewhat controversial. Chloroquine has proved to be a rather effective tissue amebicide. In my opinion, it is an effective agent in amebic hepatitis but not as good as emetine after an amebic abscess has actually formed. Chloroquine concentrates to a great degree in liver and this, no doubt, accounts for its effectiveness in amebic hepatitis. It has one big ad-

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**Col. George M. Powell, MC, Chief, Department of Medicine.

vantage over emetine in that it is far less toxic and a much safer drug to use. However, in my opinion, it does not bring about the uniformly good results that are obtained from emetine.

Regarding the toxicity of emetine, certainly this must be recognized. The precautions prescribed for its use should be rigidly followed. However, many, many treatments with emetine were administered during World War II, and relatively few disastrous results were reported. So, I do not hesitate to use emetine and, in fact, prefer it as the drug of choice for the treatment of amebic abscess of the liver. One often reads statements to the effect that drugs alone will cure an amebic abscess. This has not been my experience. Although it may be worthy of trial in the individual case, I prefer to have the abscess drained either by needle or open aspiration. Open drainage has produced better results for me than has closed drainage. Thus, on the basis of my experience, I would recommend the combination of emetine and adequate evacuation of the abscess, preferably by open drainage.

Doctor Salyer:* By and large, I agree with the statements of Dr. Powell. I also will preface my remarks by stating that it is difficult for me to reconcile the fact that this patient was observed in an installation such as this and went on to a fatality without having the benefit of someone making a tentative diagnosis of amebic abscess of the liver, subphrenic space, and complicated further by the pleuropulmonary extension to the right—an accompanying and fairly common serious complication of amebiasis, as seen in years past. A few days of so called "empirical therapy" with emetine and other antiamebic agents in vogue at that time would, in this "retrospective analysis," might have been indicated. May I also add that a surgeon or an internist well disciplined in the methods of needle aspiration could have been called in consultation. Now about aspiration and/or surgical management. A few years ago, it was considered too dangerous, because secondary pyogenic infection would often ensue and cause subsequent death of such patients in a high percentage of patients so treated. In this era of fine antimicrobial drugs and a sounder knowledge of electrolyte and nutrition problems, as well as other refinements in supportive postoperative management, I don't think we would hesitate in the least to explore such a patient surgically, evacuate and unroof abscesses in the liver, pleural space, and the lung, and instill the drugs that seem specific or of prophylactic value. Closure or drainage of pockets and spaces is always a decision that the surgeon must make at the operating table. Of course, I think we would all recommend that such a patient receive specific drugs, such as emetine and chloroquine for three or four days prior to surgical management.

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*Col. John M. Salyer, MC, Chief, Thoracic Surgery Service.

REFERENCES

1. Mackie, T. T.; Hunter, G. W., III; and Worth, G. B.: *A Manual of Tropical Medicine.* (Military Medical Manuals, National Research Council) W. B. Saunders Company, Philadelphia, Pa., 1945.

2. Ash, J. E., and Spitz, S.: *Pathology of Tropical Diseases: An Atlas.* W. B. Saunders Company, Philadelphia, Pa., 1945, pp. 79-81.

3. Seneca, H.: Amebiasis: review; pathogenesis, pathology, and clinical manifestations, *Am. J. Digest Dis.* 1:250-260, June 1956.

4. Seneca, H.: Amebiasis: review; laboratory diagnosis, differential diagnosis, and therapy, *Am. J. Digest Dis.* 1:310-322, July 1956.

DIARY OF SHIP'S SURGEON—May 22, 1841

This morning at half past one I was roused out of a most comfortable sleep by the second mate who informed me that a woman was in labour: I immediately dressed and went forward and found Mrs. Harford, who had not expected to be confined for more than a fortnight on the point of being delivered or rather I may say delivered, for the head of the child had already escaped and the body immediately followed. She had been taken with labour pains about 10 the evening before, and the stupid people about her not only neglected to tell me anything about it, but had not even made any preparations. She was in a half standing position with all her clothes on, supported by one woman in front, while another was at work in the rear, both of them in a tremendous fuss, and the poor patient yelling and groaning. The child having made its exit just as I entered, all that remained for me to do was to cut the navel string having put on two ligatures. I then got the woman put to bed and gave her a little sherry and water. After waiting about half an hour I proceeded to remove the placenta. Passing my finger up I could feel the root of the umbilical cord, and part of the placenta in the vagina, but the greater part appeared to be firmly grasped by the *os uteri* and could not be removed by any moderate degree of force. There were slight labour pains from time to time. I made another attempt during one of these, but was equally unsuccessful. I therefore resolved to leave it to nature for a while, to see what she would do and returned to bed about half past 3 . . . . About 7 I visited my patient once more: the pains had almost entirely ceased, and still the placenta was so firmly grasped, that all my efforts to extract it were fruitless: the pulse was rather weak. I gave a little more sherry and water and 15 drops of the elixir of vitriol, and an hour after 2 colocynth pills with a view to exciting the uterus to contract. About midday there were some sharp pains. I therefore made another attempt and at length with some difficulty succeeded in bringing it away entire. The child, a boy, well grown and healthy looking . . . .—R. E. Wright-St. Clair: Glimpses of Nineteenth-Century Practice. From the Diaries of Sir D. Munro, *The New Zealand Medical Journal*, April 1958.

CASE REPORTS

Bilateral Consecutive Testicular Neoplasms

PAUL GONICK, *Captain, USAF (MC)*
JAMES M. LANCASTER, *Captain, USAF (MC)*

THE first case of bilateral testicular neoplasm was reported by Livingston in 1805.[1] Since then, approximately 212 cases have been reported in the literature.[2-11] Because of the rarity of this condition, the following case is reported.

CASE REPORT

The patient had an undescended testicle on the right, first noticed at the age of 15 years. As an adolescent, he was treated unsuccessfully with hormones by a private physician. At the time of his enlistment in the Army in 1952, no abnormality of the undescended testicle was noted. Medical attention was sought in June 1955, at a military hospital, because of painful swelling of the right testicle. On examination, this testicle was found to be enlarged, hard, and located above Poupart's ligament in the inguinal canal. An associated hernia was present. On 29 June 1955, the enlarged testicle was removed without biopsy.

Grossly, the testicle was completely and smoothly encapsulated and was entirely replaced by a soft pinkish gray tissue with a smooth-cut surface arranged in large and small confluent nodules, separated by pearly gray, fine fibrous trabeculae. Microscopically, the tumor was a pure seminoma of the testis with a granulomatous stroma. Occasional vessels within the tumor were invaded, but no invasion of the cord structures was demonstrable. Physical examination and roentgenograms of the chest revealed no metastases.

X-ray therapy was instituted on 16 July 1955. In a period of 30 days 3,456 r were delivered to an area of skin 12 by 30 cm through anterior and posterior abdominal portals. Calculated tumor dose was 3,700 r to the periaortic lymph nodes. The patient tolerated therapy well and sustained only a mild skin reaction.

He remained well until June 1957, when swelling of the left testicle was first noted. This gradually increased in size. In August 1957, while overseas, he developed pain below the twelfth rib on the left that radiated into the left inguinal region. He was hospitalized on 7 August. Examination revealed the left testicle to be firm, enlarged to the size of an "oblong orange," and slightly tender. The mass did not transilluminate. No evidence of metastasis was demonstrated by physical examination, preoperative roentgenogram of the chest, or by

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intravenous pyelography. On 14 August the patient underwent testicular biopsy followed by a left radical orchiectomy.

Gross description of the tumor is not available. Microscopic sections showed anaplastic, undifferentiated cells, foci of hair follicles, and cells similar to notochord. The cord structures were not involved. The final pathologic diagnosis was teratocarcinoma with anaplastic seminoma.

The patient was referred for a second course of x-ray therapy. Over a 46-day period he received a tumor dose of 2,100 r to the periaortic lymph nodes and 1,500 r to the pelvic nodes.

The patient was re-evaluated at this hospital from December 1957 through February 1958. Physical examination revealed pigmentation of the skin on the abdomen and back and well-healed inguinal surgical scars. Chorionic gonadotropins were less than 50 mg per 24-hour urine volume. Intravenous pyelograms and roentgenograms of the chest were within normal limits. The patient was asymptomatic at the time of discharge from the hospital.

DISCUSSION

Of the 212 cases of bilateral testicular neoplasm reported in the literature, 40 cases were simultaneous tumors while the remainder occurred after the first tumor had been removed. All cell types were represented except chorioepithelioma. About one third of the bilateral simultaneous tumors were lymphomatous or sarcomatous.[2]

Hamilton and Gilbert[9] reviewed the literature on bilateral testicular tumors and of the 126 cases in which definite histologic data were available, they classified 88 as "unicellular," 30 as teratomas, 4 as adenomas, 2 as interstitial cell tumors, and 1 each as adrenal cell carcinoma and spindle cell sarcoma. They found that bilateral testicular neoplasms have been reported in an 8-month fetus and a 76-year-old man. Twenty-five per cent of bilateral testicular tumors occur in men beyond the age of 50.[9] Of the remaining 75 per cent, more than half (40 per cent) occur in the 30-44 age group.[9] In Lewis'[12] personal series of 250 tumors, there was one case of bilateral seminoma in bilaterally abdominal retained testes.

Two per cent (144 instances) of approximately 7,000 testicular neoplasms reported in the literature from 1805 to 1939, and reviewed by Hamilton and Gilbert[9] were bilateral. They estimated that the general incidence of testicular tumors among men living in the United States is about 0.0013 per cent.[13] The incidence of involvement of the second scrotal testis is 1.0 per cent in men who have had a testicular malignancy (more than 700 times the expected rate in the general male population). If the testicles are ectopic, the chances reach 15 per cent with inguinal cryptorchism and 30 per cent with abdominal cryptorchism. Inasmuch as many patients die shortly after the appearance of their first testicular tumor and thus afford limited opportunity for later

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development of a contralateral malignancy, the tendency for bilateral testicular neoplasms is probably even more pronounced than indicated above.[9,13]

Because of this high incidence of malignancy in the remaining testicle, any patient who has had one testicular neoplasm must be closely followed. Orchiopexy should be considered in the case of a remaining cryptorchid testicle in order to make it more readily available for examination.

SUMMARY

The world literature contains reports of about 212 cases of bilateral testicular tumors. All cell types seen in unilateral malignancy are reported bilaterally except for chorioepithelioma. About 2 per cent of all testicular neoplasms reported are bilateral. The possibility of the remaining testicle developing a neoplasm after one has been removed for malignancy is 1 in 100 in scrotal testis, 15 in 100 in inguinal cryptorchids, and 30 in 100 in abdominal cryptorchids. All patients should be observed indefinitely following the removal of a testicle for malignancy. Orchiopexy should be given serious consideration if the remaining gonad is cryptorchid. A case of a seminoma followed in two years by a teratocarcinoma in the other testicle is presented.

REFERENCES

1. Livingston, J.: Case of cancer of both testicles which terminated favourably by supervention of surgery. *Edinburgh M. & S. J.* 1: 163-165, 1805. Cited in reference 2.

2. Abeshouse, B. S.; Tiongson, A.; and Goldfarb, M.: Bilateral tumors of testicles: review of literature and report of case of bilateral simultaneous lymphosarcoma. *J. Urol.* 74: 522-532, Oct. 1955.

3. Arduino, L. J., and Sola, O. M.: Bilateral simultaneous seminoma of scrotal testis. *J. Urol.* 77: 47-50, Jan. 1957.

4. Coleman, P. N., and McKeown, K. C.: Case of bilateral testicular tumours: seminoma of one testis with teratoma in other. *Brit. J. Surg.* 42: 219-221, Sept. 1954.

5. Dodson, A. I., and Hooper, J. W., Jr.: Bilateral concomitant seminoma. *J. Urol.* 72: 424-427, Sept. 1954.

6. Garvey, F. K., and Daniel, T. B.: Bilateral interstitial cell tumor of testicle. *J. Urol.* 66: 713-719, Nov. 1951.

7. Gill, R. D., and Howell, R. B.: Primary bilateral testicular tumor. *J. Urol.* 59: 940-947, May 1948.

8. Graves, R. C., and Lawrence, K. B.: Bilateral embryonal carcinoma of testicle, with note on technique of orchidectomy for malignant disease. *J. Urol.* 47: 482-490, Apr. 1942.

9. Hamilton, J. B. (New Haven, Conn.), and Gilbert, J. B.: Studies in malignant tumors of testis; bilateral testicular cancer; incidence, nature, and bearing upon management of patient with single testicular cancer. *Cancer Res.* 2: 125-129, Feb. 1942.

10. Harper, J. G. M.; Dewing, S. B.; and Nagamatsu, G.: Bilateral carcinoma of testis: report of 3 cases. *J. Urol.* 71: 634-638, May. 1954.

11. Hotchkiss, R. S., and Laury, R. B.: Concomitant bilateral malignant testicular tumors. *J. Urol.* 63: 1086-1092, June 1950.

12. Lewis, L. G.: Cryptorchism. *New York J. Med.* 54: 3078-3082, Nov. 15, 1954.

13. Gilbert, J. B., and Hamilton, J. B.: Studies in malignant testis tumors; incidence and nature of tumors in ectopic testes. *Surg., Gynec. & Obst.* 71: 731-743, Dec. 1940.

Projectile Injury From Power Lawn Mower

DAVID W. FURNAS, *Captain, USAF (MC)*

THE familiar power lawn mower is a potentially lethal source of injury. Stones or similar objects thrown aside by the rotating blades can attain sufficient speed to inflict fatal wounds on bystanders. Most individuals are cautious about direct injury from mowers but the hazard of indirect injury by projectiles is not commonly appreciated. Stimulating public awareness of this danger, as well as the diagnosis and treatment of the injury, therefore, should be of concern to the physician.

A serious injury sustained in this manner was recently treated in our hospital. We are presenting here a résumé of the clinical course to illustrate the problems that can be encountered.

CASE REPORT

A 5-year-old boy was watching an adult mow his lawn. The boy stood several feet to one side of the mower so that he was facing the port from which the cut grass was expelled. The mower blade made a sudden metallic report and the child immediately complained that something had struck his abdomen. He ran home and his mother examined his abdomen. She found what appeared to be a minor laceration of the abdominal skin. Inasmuch as the child looked somewhat pale and acted peculiarly, he was taken to the base hospital.

Physical examination showed a moderately pale, drowsy appearing child who responded to questions without difficulty. A ragged, 1-cm puncture wound was apparent several centimeters below the umbilicus and just to the left side of the midline. Bowel sounds were slightly hyperactive. The tonus of the abdominal wall was slightly increased. A roentgenogram (fig. 1) showed an irregular metallic density in the lower left quadrant.

While in the x-ray department the patient rapidly developed frank signs of shock. Fluids and vasopressors were started, blood was drawn for crossmatching purposes, and the patient was taken to surgery immediately. Laparotomy revealed 400 ml of fresh blood in the peritoneal cavity. An irregular metal missile (fig. 2) was found lying within a laceration of the posterior parietal peritoneum and adjacent to the iliac vessels, but these structures were uninjured. Ten perforations of the small bowel located in the ileum and lower jejunum, and four in the mesentery were closed. No major vessels were injured. The patient was discharged from the hospital on the twelfth postoperative day.

From U. S. Air Force Hospital, Holloman Air Force Base, N. Mex.

DISCUSSION

Objects thrown from the blades of a power hand mower are occasionally hurled with sufficient force to fit the classification of a deadly missile. An average rotary power mower with a 20-

Figure 1. Roentgenogram showing location of metal fragment.

inch blade, turning over at 3500 rpm, has a blade tip velocity of about 315 feet per second. This is roughly one half the muzzle velocity of a .38 caliber revolver. While mowing a lawn, a good percentage of this velocity can be transmitted to any small object. At close range such a projectile is quite effective in inflicting injury to living tissue.

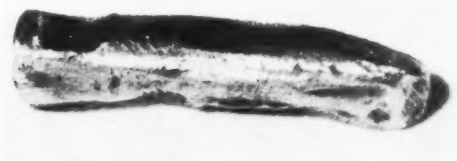

Figure 2. Metal fragment, measuring 3.8 by 0.8 cm, removed from patient.

We have encountered several injuries received in such a fashion at this facility. Fortunately, all the injuries have been of a minor nature except the one reported. The Ground Safety Division of

this base has been concerned about this hazard and has been active in warning base personnel.

A power mower should be used so that bystanders are not placed in a vulnerable position, that is, they should not face the side from which the grass is thrown. Commercial grass catchers are available that give some shielding to the mower and these would at least reduce the velocity of any projectile. Before mowing a lawn, potential projectiles should be removed from the grass.

THE EPIDEMIOLOGY OF FLYING SAUCERS

Because actual experiments with flying objects such as planes, vapor trails, weather balloons, parachutes, missiles, artificial satellites are constantly being carried on, and some of these must be kept secret for security reasons, the flying saucer has become a focal point, a kind of "goat" for the highstrung and the fear ridden. And to heighten the situation for the dramatically and mystically minded, pictures and technical reports appear in newspapers from time to time. Added to this, the newsstands are in the midst of an avalanche of science fiction magazines and cheap books relating mysteries occurring in the vast interstellar regions. In reality, however, not one saucer has been reported by any astronomical observation. No moonwatch teams, no camera, no telescope reported any strange flying object. Between 1947 and 1957 some 5700 reports have been examined by the air technical intelligence center with the same negative results. Yet, the epidemic of incredulous fantasies is going on.—Joost A. M. Meerloo: The Delusion of the Flying Saucer. *American Practitioner, Digest of Treatment,* October 1958.

BIOSTATISTICIANS HONORED. In observance of the tenth year of operation of a program designed to standardize medical forms and statistical procedures in the military departments, Dr. Frank B. Berry, Assistant Secretary of Defense (Health and Medical), recently presented letters of appreciation to the chiefs of the biostatistical divisions in the Offices of the Surgeons General of the Army, Navy and Air Force. Presentations were made during a luncheon meeting held at the Pentagon. Those present on the occasion, from left to right, were: Dr. Edward H. Cushing, Deputy Assistant Secretary (H & M); Major General Silas B. Hays, Surgeon General of the Army; Dr. H. M. C. Luykx, Chief, Biometrics Division, Office of the Air Force Surgeon General; Major General Oliver K. Niess, Surgeon General of the Air Force; Mr. E. L. Hamilton, Chief, Medical Statistics Division, Office of the Army Surgeon General; Dr. Berry, who made the awards; Dr. W. V. Charter, Director, Medical Statistics Division, Bureau of Medicine and Surgery; Mr. Foster Adams, Director, Statistical Services Center, Office of the Assistant Secretary of Defense (Controller); and Rear Admiral Bruce E. Bradley, Deputy Surgeon General of the Navy.

OFFICER HEADS AERO MEDICAL ASSOCIATION MEETING IN LOS ANGELES, APRIL 27-29

Brigadier General M. Samuel White, USAF (MC), president of the Aero Medical Association, has announced that more than 250 aviation and space bioscientists will present the results of their latest research and clinical achievements during the thirtieth annual meeting of the society at the Statler Hilton Hotel, Los Angeles, 27, 28, and 29 April. General White is director of staffing and education for the Air Force Surgeon General.

General White

The scientific program of the meeting, arranged by a committee under the chairmanship of Brigadier General Don Flickinger, USAF (MC), has selected for presentation a series of papers covering the biological aspects of flight from the standpoint of clinical and forensic aeromedicine, basic research applicable to aviation medicine, and the development, testing, and operational aspects of this specialty. During most of the meeting, scientific sessions will be conducted simultaneously in three large assembly rooms of the hotel. Panels will be devoted to civil aviation medicine, aviation pathology and accident prevention, and space bioscience and technology. Other sessions will be held on acceleration, biomechanics, disorientation, human engineering, psychophysiology, and weightlessness.

A large number of the speakers are from Department of Defense specialized facilities, including the Armed Forces Institute of Pathology and U. S. Army Missile Ballistic Agency; the U. S. Naval School of Aviation Medicine, Air Crew Equipment Laboratory and Aviation Medical Acceleration Laboratory; and the U. S. Air Force School of Aviation Medicine, Aero Medical Laboratory, Aeromedical Field Laboratory and Arctic Aeromedical Laboratory.

The fifth Louis H. Bauer lecture, established in 1955 as a tribute to the Association's founder and a pioneer military flight surgeon, will be given on 27 April by Dr. Hans Selye, distinguished professor and director of the Institute of Experimental Medicine and Surgery of the University of Montreal. His subject is "Stress in Aviation Medicine." Dr. Selye also will serve as chairman of a symposium on the aeromedical aspects of stress.

The annual recipients of the Lyster, Longacre, Tuttle, and Liljencrantz Awards, established in honor of early military flight surgeons and given annually by the Association for achievements in aerospace

medicine, will be announced at the traditional banquet on the last day of the meeting.

Among the officers and scientists of the military services who will preside at various sessions are Brigadier General Sam F. Seeley, MC, USA (Ret.), Captains Charles F. Gell and Ashton Graybiel, MC, USN; Colonels Harold V. Ellingson and John P. Stapp, Lieutenant Colonel James P. Henry and Major Edwin R. Ballinger, USAF (MC); Air Commodore William K. Stewart, RAF; and Walter F. Grether, Ph. D., Henry A. Imus, Ph. D., and Horace O. Parrack, Ph. D. The membership of the executive council of the Association includes Brigadier General Victor A. Byrnes, USAF (MC), Rear Admiral Bertram Groesbeck, MC, USN (Ret.), Captains Clifford P. Phoebus, Oran W. Chenault and Ashton Graybiel, MC, USN; and Colonels Theodore C. Bedwell, Jr., and Benjamin A. Strickland, Jr., USAF (MC).

AIR FORCE SAFETY AWARD. Climaxing an enviable record of more than 19,000 accident free "air hours," the 1st Aeromedical Transport Group, Brooks Air Force Base, Texas, recently received the U. S. Air Force Safety Award Plaque. This is the second such award won by the group, the first being the MATS Flying Safety Outstanding Group Award for 1957, when its aircraft and crews flew more than 39,792 accident free hours, and made 25,000 safe landings, many times under adverse conditions. Receiving the plaque from Major General Russell L. Waldron (left), Commander, Western Air Transport Service, during his recent visit to Brooks, is Colonel Luther B. Matthews, group commander.

THEODORE ROOSEVELT CENTENNIAL. Arriving in the Panama Canal Zone for the unveiling of a bronze bust of President Theodore Roosevelt in celebration of the centennial of his birth, this group of distinguished guests was greeted by the Caribbean Command's Commander-in-Chief, Lieutenant General Ridgely Gaither, USA, and the Canal Zone Governor, Mr. William E. Potter. Left to right: Mr. Edward A. Bacon, Deputy Assistant Secretary of the Army, donor of the heroic bust; General Gaither; Governor Potter; The Honorable George H. Roderick, Assistant Secretary of the Army; and Dr. Frank B. Berry, Assistant Secretary of Defense (Health and Medical).

NEW AIR FORCE TRAINING COURSES

The Air Force has announced the development of two new courses in the military aspects of sanitary and industrial hygiene, designed to meet Air Force requirement for sanitary and industrial hygiene engineers. Two classes will be held each year at Gunter Air Force Base, Alabama, the first in September 1959 and the second in February 1960. It is planned that sanitary and industrial hygiene engineer officers coming on active duty will attend this course prior to assignment.

FIRST USAF NURSE COMPLETES STAFF COURSE

The first Air Force nurse to graduate from the Air University Command and Staff School correspondence course, Major E. Lynne Christy is a licensed pilot with more than 200 flying hours. She was active in the Civil Air Patrol while serving at Dhahran Air Base in Saudi Arabia and has the distinction of being one of the first nurses assigned to England with the Eighth Air Force during World War II. A flight nurse since 1950, Major Christy is currently assigned in the Office of the Air Force Surgeon General.

Major Christy

AWARD TO DENTAL OFFICER. Major Jack L. Hartley, USAF (DC), son of Colonel and Mrs. Leroy Hartley (Ret.), Carmel, Calif., and dental officer in the School of Aviation Medicine's Department of Experimental Dentistry, receives the Air Force Commendation Medal from Major General Otis O. Benson, Jr., Commandant of the School at Randolph Air Force Base, Texas. Major Hartley was awarded the decoration for exceptionally meritorious service over a seven-year span, during which time he was assigned to the National Bureau of Standards in Washington, D. C., and to the School of Aviation Medicine.

RESERVE DENTIST MADE ADMIRAL. Dr. William McGill Burns, New York dentist, is shown being sworn in as a rear admiral in the U. S. Naval Reserve by Rear Admiral Chester C. Wood, right, Commandant of the Third Naval District, in a recent ceremony attended also by Rear Admiral Clifford C. DeFord, District Dental Officer. Dr. Burns is the fourth reserve dental officer to be given flag rank.

MEXICAN MEETING. Rear Admiral Rafael Vargas Salazar (center), Surgeon General of the Mexican Navy, was host at his home to Dr. Frank B. Berry (right), Assistant Secretary of Defense (Health and Medical), and Rear Admiral Bartholomew W. Hogan, U. S. Navy Surgeon General, when they recently visited Mexico City.

NAVY DOCTOR GIVEN SPACE MEDICINE AWARD

Captain Gell

The Melbourne W. Boynton Award for Space Medicine, given annually by the American Astronautical Society for an outstanding contribution to astronautics through medicine, was presented recently to Captain Charles F. Gell, MC, USN. The 1958 award was made to Captain Gell for his work in the multicrew long duration confinement and explosive decompression of mammals. Rear Admiral Edward C. Kenney, Assistant Chief of the Bureau of Medicine and Surgery for Personnel and Professional Operations, made the presentation of the award at the annual meeting of the society in Washington. Captain Gell is currently serving as special assistant for medical and allied sciences of the Office of Naval Research.

Correspondence

THE PALPATING HAND

To the Editor:—I have read with interest and admiration Lieutenant Colonel Eddy D. Palmer's paper "Palpability of the Liver Edge in Healthy Adults" in your December issue. Dr. Palmer has made observations in this regard in 1,000 persons during "routine," I repeat his word *routine,* physical examinations made for administrative reasons. Obviously he has kept careful and accurate records of his data over a long period of time. Instead of approaching this type of examination as an uninteresting chore necessary in performing his military duties, he has realized that there is something to be learned and valuable information to be accumulated from any physical examination if not approached in a perfunctory fashion. This is an old-fashioned form of clinical research which required only an inquiring mind, a palpating hand, and a centimeter rule to amass fundamental information valuable to Dr. Palmer and to all who read his paper. There's not a ketosteroid, an isotope, an electrolyte, or a catecholamine in the whole paper. This type of work is now expected of Dr. Palmer, for no matter where he has served he has used the enormous opportunities of army medicine to educate himself and through his excellent reports of his studies to teach the rest of us.

WORTH B. DANIELS, M. D.
Washington, D. C.

A Message From the A. M. A.

During the Twelfth Clinical Meeting of the American Medical Association in Minneapolis, Minnesota, early in December 1958, the House of Delegates of the A.M.A. considered several subjects which are of interest to military medicine. Action was taken by the House in regard to the curtailment of the Medicare program, utilization of reserve military units and personnel in the initial phases of civil defense operations, the rank of the Director of the Armed Forces Institute of Pathology, service membership in the American Medical Association and the use of Veterans Administration facilities.

Concerning Medicare, the House of Delegates noted that the program had been curtailed by the elimination of several categories of treatment and by the restriction of freedom of choice between military and civilian facilities by channeling more dependents into military facilities in order to reduce the cost of the program. The House expressed regret to the extent that federal facilities had been substituted for private care and urged the encouragement of the re-establishment of services under the free choice principle to accomplish the original intent of the Act.

In regard to the subjects of military reservists, the Armed Forces Institute of Pathology, and service membership, the House of Delegates adopted resolutions.

The resolution concerning the deployment of reserve military units and personnel to strengthen civil defense operations in a disaster situation is as follows:

Whereas, It is imperative that the present civil defense organization be reinforced and strengthened to make it capable of meeting the demands for massive medical and health services resulting from an enemy attack or other large-scale national disaster; and

Whereas, The reserve units of the Armed Forces are organizations in being which are capable of giving the type of service that could reinforce and strengthen the present civil defense effort in its initial phases without dislocating the defensive capability of the armed forces; and

Whereas, Such units would not be called and deployed immediately after an enemy attack; and

Whereas, The care of noncasualties and the care of casualties will be of prime importance as a medical activity in the ability of the United States to mobilize after an enemy attack and to initiate and sustain a counter attack which will determine to a large extent our ability to survive as a nation; therefore be it

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From the Council on National Defense of the American Medical Association. The views and opinions expressed are not necessarily those of the department of Defense. —*Editor*

Resolved, That the American Medical Association take immediate steps to recommend that discussion with appropriate federal departments be started with a view to developing a plan whereby reserve units and individuals who are not immediately involved in military operations, should be used to supplement civil defense operations; and be it further

Resolved, That a plan be developed with appropriate federal departments whereby reserve units be given an interim mission of supplementing civil defense operations in these initial activities; and be it further

Resolved, That consideration be given to the formulation of an orderly plan for the rapid training of civilians who have no military obligation to fill the places of medical reservists; and be it further

Resolved, That a plan be explored for the recruitment, training and use of former medical personnel who have no further military obligation so that their services may be utilized for civil defense purposes.

With respect to the rank of the Director of the Armed Forces Institute of Pathology, the House of Delegates of the American Medical Association adopted the following resolution:

Whereas, By virtue of the importance of the Armed Forces Institute of Pathology to both military and civilian medicine and more especially to Pathology in the world today, and in order to provide an adequate recognition of the responsibilities placed upon the Director of the Armed Forces Institute of Pathology; therefore be it

Resolved, That the American Medical Association petition the Secretary of Defense to provide for general or flag rank for the Director of the Armed Forces Institute of Pathology during his tenure of office.

The adopted resolution pertaining to the membership of Armed Forces, Public Health Service and Veterans Administration physicians in the Association follows:

Whereas, It is the policy of the Association as indicated in its Constitution and Bylaws to condition Active Membership upon membership in a constituent association; and

Whereas, Service Membership is a depature from this principle and should be granted only in unusual circumstances, such as ineligibility for local county society membership; and

Whereas, It is sometimes impossible for physicians in the Armed Forces, Public Health Service, or Veterans Administration to obtain membership in constituent associations because of certain component society residence or practice requirements; therefore be it

Resolved, That the House of Delegates of the American Medical Association urge all component societies to make every effort to provide a type of membership for Armed Forces, Public Health Service, and Veterans Administration physicians which will enable them to become Active Members of constituent societies and of the American Medical Association.

In another action, the policy adopted by the House of Delegates in November 1956 in regard to the use of Veterans Administration facilities was reaffirmed. This states that "... Veterans Administration facilities should be used only for the care of service-connected diseases and disabilities, and that the care of non-service-connected conditions should be the responsibility of the individual, or, if he is medically indigent, of his community or state." It further stated, that, "... until existing law is changed, priority for any non-service-connected care provided should go to those suffering from illnesses or disabilities which are economically catastrophic."

Also reaffirmed was the resolution adopted by the House of Delegates in June 1958, to "... urge Congressional action to restrict hospitalization of veterans in Veterans Administration hospitals to those with service-connected disabilities."

The House urged that medical societies at all levels develop committees to assist in guaranteeing Veterans Administration hospital admissions for service-connected cases and for those cases where an illness constitutes an economic disaster which would justify care by a Veterans Administration hospital.

Deaths

BUSHARD, Bruce Lauren, Lieutenant Colonel, MC, USA, of Getchell Mines near Redhouse, Nev.; assigned to the Office of the Surgeon General, Washington, D. C.; graduated in 1947 from Northwestern University School of Medicine; appointed a second lieutenant in the Army of the United States 26 October 1942; resigned 6 June 1943; appointed a first lieutenant in the Army of the United States 17 March 1946; ordered to active duty 7 July 1947; commissioned a first lieutenant in the United States Army 22 October 1948; died 10 December 1958, aged 36, in Washington, D. C., of carbon monoxide poisoning.

DILLON, John Alfred, Jr., Lieutenant Colonel, USAF (MC), of Rapid City, S. Dak.; stationed at U. S. Air Force Hospital, Bergstrom Air Force Base, Tex.; graduated in 1935 from the University of Kansas School of Medicine, Kansas City, Kans.; appointed a first lieutenant in the Army of the United States 24 July 1935; ordered to active duty 1 July 1936; appointed a lieutenant colonel in the United States Air Force Reserve 14 October 1950; ordered to active duty 1 December 1950; died 18 November 1958, aged 49, at U. S. Air Force Hospital, Lackland Air Force Base, Tex., of pulmonary edema due to cardiac failure and pneumonia.

MUIR, Mark Devlin, Captain, MC, USA, of Rock Springs, Wyo.; stationed at Letterman Army Hospital, San Francisco, Calif.; graduated in 1955 from Creighton University of Medicine, Omaha, Neb.; appointed a first lieutenant in the Army of the United States 9 April 1956. Reported for active duty with rank of captain on 9 July 1956; commissioned a captain in the United States Army on 29 July 1958; died 22 November 1958, aged 31, at Letterman Army Hospital of barbiturate poisoning.

Officers Certified by Specialty Boards

The Surgeons General of the military medical services have announced that the following regular Medical and Dental Corps officers have been certified by the boards indicated.

American Board of Radiology

Nuclear Medicine

Gunn, Walter G., Capt., USA

American Board of Obstetrics and Gynecology

Peterson, William F., Lt. Col., USAF

American Board of Internal Medicine

Miller, Perry B., Maj., USAF
Smith, Philip J., Col., USA
Spivey, Charles G., Capt., USAF
Tormey, David M., Maj., USA

American Board of Pathology

Richey, Theodore W., Capt., USAF

American Board of Ophthalmology

Stokes, James A., Capt., USA

American Board of Anesthesiology

Didier, Edward P., Capt., USAF

American Board of Preventive Medicine

Occupational Medicine

Grant, Lee B., Lt. Col., USAF

American Board of Oral Pathology

Knapp, Milton J., Capt., USA

Official Decorations

The following awards were recently announced by the Departments of the Army and the Air Force.

Legion of Merit

Joseph R. Shaeffer, Col., MC, USA

Army Commendation Ribbon with Metal Pendant

Torivio Silva, Maj., MSC, USA

Air Force Commendation Medal

Jack L. Hartley, Maj., USAF (DC)

Book Reviews

REHABILITATION OF THE CARDIOVASCULAR PATIENT, by *Paul Dudley White,* M.D.; *Howard A. Rusk,* M.D.; *Philip R. Lee,* M.D.; and *Bryan Williams,* M.D. 176 pages; illustrated. McGraw-Hill Book Company, Inc., The Blakiston Division, New York, N.Y., 1958. Price $7.

This publication fills a long existing void for the post-acute handling of the cardiovascular patient. It could be classified as a working handbook on the subject. The term rehabilitation is used to designate all those services which the patient with a cardiovascular disability needs in order to live as rich, satisfying, and productive a life as possible. Hence, rehabilitation is the responsibility of every physician. The book is directed to all practitioners who bear the responsibility for the management of patients with cardiovascular disabilities. The eight chapters include discussions of historical significance, contemporary significance, cerebral vascular disease, cardiac disease, rheumatic fever and rheumatic heart disease, congenital heart disease, hypertension or hypertensive heart disease and coronary heart disease. Thirty-one illustrations, forms and photographs are provided, together with a fairly extensive bibliography. To this reviewer, the most informative section was that on cerebrovascular disease. Useful range-of-motion, muscle examinations, activities-of-daily-living charts are shown. The tremendous support given through the field of physical medicine is indicated. The purpose of the book is well served. Despite its price, which may be a reflection of the inflationary trend of the time, the acquisition of the text for military medical libraries is urged.

—*ARCHIE A. HOFFMAN, Col., USAF, (MC)*

MILESTONES IN MODERN SURGERY, by *Alfred Hurwitz,* M.D., and *George A. Degenshein,* M.D., with a foreword by *J. Englebert Dunphy,* M.D. 520 pages; illustrated. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N.Y., 1958. Price $15.

Most of this outstanding book on medical history is devoted to developments of surgery and adjunct surgical care within the current century although it begins with observations by Paré in 1585. It ends with a section which is entitled, both properly and hopefully, "Milestones on the Horizon," and which includes the description of Gibbon's mechanical heart and lung apparatus for cardiac surgery and the successful homotransplantation of the human kidney between identical twins by Merrill and his associates in 1956. These remarkable achievements, as well as others in the text, naturally bring to one's mind certain pronouncements made by surgical authorities in the past. It was in 1855, for instance, that Erichsen said that the practice of surgery was at its climax and no further advances were possible. It was in 1887 that Stephen Paget said that surgery of the heart had reached the limit set by nature to all surgery and that no new method or discovery could overcome the natural difficulties that attend a wound of the heart. The three chapters on cardiac surgery in this book indicate the risks of being dogmatic about anything at all in medicine.

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The papers reprinted were selected by three criteria: that the article represented a significant surgical advance; that it demonstrated the scientific method; and that the principle or method described was still of current value. These criteria did not necessarily result in the selection of the earliest publication on the particular subject. Mont Reid's lucid article on problems of wound healing, for instance, was chosen in preference to any of Lister's original articles because it crystallized the whole subject so excellently. This reviewer regrets at least one omission. Reginald Fitz's superb description of acute appendicitis in 1886, an article which has unquestionably saved many more lives than, for instance, Bassini's description of a technic for inguinal hernioplasty.

An interesting and unusual feature of the book is the brief biography of the author of each article, together with his picture.

—*JOHN B. COATES, Jr., Col., MC, USA*

COMPLETE DENTURE PROSTHESIS, by *Daniel H. Gebl,* D.D.S., and *O. M. Dresen,* D.D.S. Formerly by *Rudolph O. Schlosser,* D.D.S., F.A.C.D. 4th edition. 542 pages; with 310 figures. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $11.

The fourth edition of this text contains many important changes necessary to reflect new, improved technics and the use of new materials that have been developed for impression procedures. It provides a comprehensive, detailed step-by-step procedure for making functional and comfortable complete dentures. The final chapter is of value for that occasional problem patient with extreme mandibular prognathism, maxillary prognathism, abnormal facial deformity or surgical loss of bone resulting in anomalies of the jaws and their relationship. The authors have presented the subject of functional dentures in a detailed and readable form, including a discussion of new material on the hinge axis, technics for obtaining centric relation, modern concepts in selection of tooth form as well as nutritional deficiencies and systemic diseases as they relate to tissue tolerance and irritation. This volume is highly recommended as a ready reference for all practicing dentists.

—*THEODORE E. FISCHER, Col., USAF, (DC)*

COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION, Volume 49, 1957. Published June, 1958. Editorial Staff: *Carl M. Gambill,* A.B., M.D., M.P.H.; *James R. Eckman,* A.B., M.A., Ph.D.; *M. Katharine Smith,* B.A.; *Florence L. Schmidt,* B.S.E.; *George G. Stilwell,* A.B., M.D.; *Guy Whitehead,* B.A., M.A., Ph.D. Senior Consultants: *Richard M. Hewitt,* B.A., M.A., M.D., and *John R. Miner,* B.A., Sc.D. Compiled by *George G. Stilwell,* A.B., M.D. 827 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $13.

This volume is composed of selections from the published papers of the staff of the Mayo Clinic for the year 1957. The majority of the papers are abridged but some 30 are reproduced in their entirety. The widely diversified subject matter has been arranged into sections under organ systems. The editorial staff in their selection had the "interests of the general practitioner, the general surgeon and the diagnostician in mind." They appear to have been highly successful. The collection

is surely of general interest and written in a style which makes it relatively light, enjoyable reading. Although each section contained many articles of interest, this reviewer, an internist, found especially entertaining the sections on radiology, the alimentary tract, and blood and circulatory organs. This 49th annual volume will be a welcome addition to any bookshelf. It is enthusiastically recommended, not as a text or reference, but for interesting, informative and authoritative reading.

—*R. J. PEARSON, Jr., Capt., MC, USN*

ROENTGEN-DIAGNOSTICS, Progress Volume 1, by *H. R. Schinz, R. Glauner,* and *E. Uehlinger,* with the collaboration of *W. E. Baensch, J. E. W. Brocher, U. Cocchi, R. Glocker, W. Hess, R. Janker, O. Norman, R. Prevot, G. Schoch, E. Uehlinger, S. Welin, J. Wellauer,* and *E. Zdansky.* Translated from the German by *James T. Case,* M.D., D.M.R.E. 623 pages; with 545 figures containing 892 illustrations. Grune & Stratton, Inc., New York, N.Y., 1958. Price $35.

The purpose of this book, as stated by the authors, is to assist the physician in keeping abreast of the trend of events in diagnostic roentgenology by the presentation of critical and comprehensive reviews on the subjects covered, after the large numbers of individual contributions in the literature have been studied and evaluated. The reviews cover a wide range of subject matter, with an extensive bibliography following each review.

A considerable portion of the material presented deals with specialized procedures which are being used with increasing frequency, but which have not yet become entirely standardized. Comprehensive and authoritative appraisal, with detailed descriptions of technical procedures and discussion of film interpretation, is of value to the roentgenologist. The material is well presented. Illustrations are largely reproductions of radiographs and are generally of high quality, although these reproductions are positive prints rather than negatives, which are now almost always used in this country. That Dr. Case, one of the distinguished American pioneers in radiology, and who, through the years, has made so much valuable German radiological literature available in English, should have undertaken the translation of the volume, is adequate recommendation of its merits. He has been assisted by a group of able American and German radiologists. This book is a worthy addition to any library of diagnostic roentgenology but, unfortunately, its cost will somewhat restrict its wide availability.

—*CARR E. BENTEL, Capt., MC, USN*

TRANSPORTATION OF THE INJURED, Emergency Procedures for Ambulance Crews, Training, Equipment, Vehicles, and Responsibility for Ambulance Service, by *Carl B. Young, Jr.,* M.P.H. Collaborating physician: *Carl B. Young,* M.D., F.A.C.S. Drawings by *Richard Fry, Jr.,* B.S. 238 pages; illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1958. Price $6.75.

There has been a great need for this type of manual. The author has presented his material with the clearness and simplicity necessary for understanding by both professional and nonprofessional personnel concerned with the immediate attention and transportation of the injured. The book has been divided into two sections; one prepared for the use

of ambulance crews and others directly responsible for the handling of the injured; and the other for those who are legally and morally responsible for providing the people of any community with efficient ambulance service. The manual is complete and well illustrated with drawings and photographs. Many of the on-the-scene pictures of ambulance crews in action are not for the squeamish, but dramatically illustrate the text subject. It is highly recommended and should be made required reading for people concerned with this problem.

—*LEWIS L. HAYNES, Capt., MC, USN*

INTRACARDIAC PHENOMENA IN RIGHT AND LEFT HEART CATHETERIZATION, by *Aldo A. Luisada,* M.D., and *Chi Kong Liu,* M.D., 2d edition, 179 pages; illustrated. Grune & Stratton, Inc., New York, N.Y., 1958. Price $9.50.

This is a revised and enlarged second edition of an earlier volume, *Cardiac Pressures and Pulses,* which contains added data on intracardiac phenomena obtained from cardiac catheterization studies. Of its 14 chapters, the first six of which describe the cardiac circle, the technic of catheterization, normal patterns of pressure in the cardiac chambers and large vessels, the technic of intracardiac-phonocardiography and the intracardiac-electrocardiogram. Others include abnormal patterns and abnormal pressure measurements and their interpretation; an essay on the intracardiac-phonocardiography in mitral and aortic valve lesions; artifacts that can be produced in all intracardiac measurements; and a short discussion on the mathematical formulas that can be solved with data obtained from intracardiac pressures and chemical analysis of the blood. A tabular summary of the various cardiac diseases and difficulties, whose diagnoses can be more precisely defined by the technics of cardiac catheterization on the basis of pressure and chemical analysis, is also given. This monograph will be of interest to cardiologists doing cardiac catheterization and especially to the students in these laboratories. It will be of value to internists who wish to keep conversant with the technics of cardiac catheterization and the contribution this method makes to more precise cardiovascular diagnosis.

—*WILLIAM D. PRESTON, Col., USAF, (MC)*

ADVANCES IN PEDIATRICS, Volume X. Editor *S. Z. Levine;* Associate Editors: *John A. Anderson, Margaret Dann, A. Ashley Weech, Myron E. Wegman,* and *Warren E. Wheeler.* 362 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $9.

The author of this annual volume again has selected a number of topics which are of contemporary interest, not only to pediatricians but also to the profession at large. Each of the seven chapters in this new edition is written by a recognized expert in his field. There are chapters on psychologic principles in pediatric practice, treatment of tuberculosis in childhood, convulsive disorders in infants and children, prevention of poliomyelitis by vaccination, staphylococcal infections in nurseries, muscular disorders of childhood, and the transfer of antibodies from mother to offspring. The presentations are written carefully and are almost encyclopedic in scope. Each article contains an extensive list of references for those interested in obtaining more detailed

information of the subjects mentioned in general terms. An excellent subject-and-author index further enhances the book's value. This volume is enthusiastically recommended for anyone interested in the medical problems of children.—*THOMAS E. CONE, Jr., Capt., MC, USN*

EXTERNAL COLLIMATION DETECTION OF INTRACRANIAL NEOPLASIA WITH UNSTABLE NUCLIDES, by *G. M. Shy,* M.D., M.R.C.P., *R. B. Bradley,* B.S.; and *W. B. Matthews, Jr.,* B.S.; with a chapter on Scintillation Spectrometry, by *J. E. Francis,* B.S.; *P. R. Bell,* Ph.D.; *and C. C. Harris,* M.S. 144 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., exclusive U. S. agents, 1958. Price $7.

Under this formidable title, a recent refinement in radioisotope localization of cerebral lesions is described. The collimators, which are devices for focusing desired radiation to the crystal of a moving scintillation detector, were particularly designed for the instrument used. Iodine^{131} in the form of radioiodinated serum albumin (RISA) is the preferred isotope. Further details are elaborated in the text. Advantages given for this localization technic include designation of size of lesions as well as multiplicity of lesions. In comparison with other procedures such as arteriography or pneumoencephalography, there is little hazard, but it is not compared with electroencephalography. Disadvantages of the technic are failure to delineate types of lesions and failure to demonstrate lesions in proximity to the sella or at the sella. Convexity lesions render best results. Heavy concentrations of isotopes can also be detected under abnormal conditions in the central parts of each hemisphere, the so-called radiologic "hole." Posterior fossa lesions, unless in or near the mid-line, may also be discovered. The authors conclude that their method approaches the usefulness of air studies in accuracy. This recent refinement is probably not the last word to be written and other technics, no doubt, will follow. Nevertheless, for those particularly interested in this phase of radioisotope localization, the book is heartily recommended.

—*ARTHUR J. LEVENS, Lt. Col., MC, USA*

THERAPEUTIC EXERCISE, Volume III of Physical Medicine Library, edited by *Sidney Licht,* M.D. 36 contributors. 893 pages; illustrated. Elizabeth Licht, Publisher, New Haven, Conn., 1958. Price $16.

The basic science principles related to exercises and exercise technics are presented in this unsurpassed volume by 36 contributors, each of whom is an authority in his own field or in physical medicine. At the beginning of many chapters a brief summary of the development of the subject matter is presented. A bibliography, listed at the end of each chapter, by outstanding American and English writers, indicates where further information can be obtained.

This is a valuable, comprehensive, detailed, convenient, new addition to the texts on this subject. The coverage is vast and the book integrates and describes the various basic exercises for specific conditions, and points out the general principles on which therapeutic exercises should be based. It is an excellent source and reference book for the physiatrist, orthopedist, general physician, and physical therapist who is interested in the field of therapeutic exercises. The majority

of the illustrations are schematic and they are especially good in the chapter on scoliosis, but they are lacking in the chapter on manual muscle testing. Photographic reproductions would have added to the value of the book. The value of background material is appreciated by this reader but much of it could have been omitted.

Dr. Licht has done an excellent job of editing this book and preparing a historical background on therapeutic exercises from the pre-Christian area to the present. This one volume encompasses the modern concept of therapeutic exercises for various conditions and systems. It is a worthwhile book for the physician's library and it is highly recommended.

—*GEORGE E. VAUPEL, Capt., MC, USN*

REHABILITATION IN INDUSTRY, edited by *Donald A. Covalt,* M.D., with a foreword by *Howard A. Rusk,* 11 contributors. Modern Monographs in Industrial Medicine, Editor in Chief: *Anthony J. Lanza,* M.D., Consulting editor: *Richard H. Orr,* M.D. 154 pages; illustrated. Grune & Stratton, New York, N.Y., 1958. Price $6.

This book is intended for the general practitioner and gives a fine insight into the rehabilitation aspects of the management of trauma. In the Armed Forces, where trauma is the greatest cause of noneffectiveness, this guidance is invaluable to the medical officer in the dispensary or small hospital who first sees the patient and initiates treatment. Of particular value is the discussion of the management of the psychologic complications of trauma. Where applicable, excellent brief discussions of basic normal and disturbed physiology are included. This effectively provides a background for understanding rehabilitation procedures and technics. The chapters on vascular, soft tissue, back and hand injury are excellent. They are especially applicable to the small medical facility where neither special training nor special equipment is a usual resource. The sections on amputations and spinal cord injuries are directed to specialized treatment centers, but the guidance for early management of these types of injury is excellent. This monograph places rehabilitation in the perspective that involves the physical, psychic and socio-economic aspect of the patient; medical care at each echelon of treatment has a rehabilitation responsibility. It clearly states basic principles and guidance for the early return of patients to effective duty. This book is recommended for general practitioners, general duty medical officers and dispensary surgeons.

—*LOUIS C. KOSSUTH, Col., USAF, (MC)*

THE NEUROLOGICAL EXAMINATION, Incorporating the Fundamentals of Neuroanatomy and Neurophysiology, by *Russell N. DeJong,* M.D. 2d edition. 1078 pages; with 368 illustrations. Paul B. Hoeber, Inc., New York 16, N.Y., 1958. Price $20.

This is the second edition of an excellent reference book which has been of great assistance to students of neurology since it was first published in 1950. In almost every chapter or section one can find changes, additions, or deletions which testify to careful and thorough revision of the entire work. The great wealth of information integrating neuroanatomy and physiology with their clinical implications is carefully organized and easily readable. The index allows rapid reference. New material

is not extensive but there is further emphasis on cortical and thalamic sensory disturbance, newer developments in visual field testing and central regulation of ocular movement, special audiometric technics, present view of the pyramidal system, the so-called extraphyramidal complex, and the brain stem reticular formation and their relation to disorders of motor functioning, the influence of the reticular formation in disturbances of sleep and consciousness, and the anatomic basis for psychomotor or temporal lobe epilepsy. A chapter on suspected hysteria and malingering is of special interest to the military physician. The author's recording of these subtle diagnostic aids is excellent. The young student in neurology can tap reflexes with his finger and can carry much data in his mind, but it is very helpful to have a reflex hammer, and to have a copy of "DeJong" near his desk.

—*THEODORE M. BADGLEY, Maj., MC, USA*

AUTOPSY DIAGNOSIS AND TECHNIC, by *Otto Saphir,* M.D. Foreword by *Ludvig Hektoen,* M.D. 4th edition. 549 pages; illustrated. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N.Y., 1958. Price $8.50.

In this new edition the author has again in admirable fashion reached his intended goal, namely, to produce a manual which will aid the student, intern, and young assistant, not only in the proper performance of an autopsy, but in the reasonable and accurate evaluation of his findings. Four new features have been added, two of them timely, and all of interest. For the first time a historical introduction, borrowed from Dr. Sidney Farber, has been included and serves as a ready, though brief, reference to the history of the autopsy. The tables on weights and measures, new to this edition, are very appropriate in a text of this kind. The first of the timely chapters deals with precautions to the pathologist dealing with patients who have been treated with radioactive isotopes. The inclusion of a chart contained in "U. S. Bureau of Standards Handbook No. 65, *Safe Handling of Bodies Containing Radioactive Isotopes,*" showing approximate remaining levels of radio-activity on successive days, would have been a valuable addition to this chapter. The second new chapter concerning the collection of tissue bank material is timely, but appears to contain an error on page 482, where it states that material should be taken from patients over 40 years of age. The chapters dealing with authorization for autopsy and findings in unexpected death have been appreciably expanded. Particularly valuable is the discussion on malpractice, coroners' cases, and authorization of an autopsy. The section on heart and blood vessels is a pleasure to read, as it again reflects the great interest and the profound knowledge possessed by the author in this subject, although condensed sufficiently to fit the purpose of this handbook.

—*KENNETH F. ERNST, Col., MC, USA*

RADIOACTIVE ISOTOPES IN CLINICAL PRACTICE, by *Edith H. Quimby,* Sc.D.; *Sergei Feitelberg,* M.D.; and *Solomon Silver,* M.D. 451 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1958. Price $10.

This is the latest of a series covering the clinical use of radioisotopes compiled from teaching material used by the authors who have

offered a four-week, full-time comprehensive course since June 1954. Two of the authors, Drs. Quimby and Feitelberg, are primarily interested in physics, and thus two thirds of the book are devoted to this aspect of the clinical use of isotopes. For this reason, perhaps the title is misleading. The average clinician will find only a minimal discussion of various established diagnostic and therapeutic uses of isotopes. The basic physics section, written by Dr. Quimby, is particularly well done and is an excellent review of the material. The methods of dose calculations are clearly spelled out and the mathematical formulas well explained. The part on instrumentation and laboratory methods suffers by comparison in as much as this is a rapidly expanding field and a number of instruments described have already been superseded by detectors that are not only easier to operate but more reliable. The principles, however, have not changed and the sections relating to these are good. It is surprising that there is little reference to newer methods of low-level counting which will not only reduce the amount of radioactivity required, but will increase the physician's capability of following the patient over a period of time. The liberal use of diagrams and schematics throughout the book helps to explain difficult points. This book is recommended as a basic reference particularly in the physical aspects of the clinical use of isotopes.

—*JAMES B. HARTGERING, Lt. Col., MC, USA*

PROGRESS IN RADIATION THERAPY, edited by *Franz Buschke,* M.D. 284 pages; illustrated. Grune & Stratton, Inc., New York 16, N.Y., 1958. Price $9.75.

The development of radiation therapy from its beginning to the present is outlined in general and at times in considerable detail in this first of a contemplated series of annual or biennial books of the same title. Though the book is general in scope specific chapters discuss renal embryoma, intracranial malignancy, radiation tolerance of the central nervous system, thyroid carcinoma, and nonmalignant eye diseases. These subjects were apparently selected because of their controversial nature. Adherence to generalities or the addition of other specific chapters would probably have enhanced appeal of the book for most readers. Each chapter is followed by an extensive bibliography. For the older radiologist it is interesting, refreshing, and provides ready references for more detailed reading. It is for the resident in radiology that the book is of particular value. All physicians interested in the treatment of malignant disease by radiation therapy will find it useful.—*PAUL A. PADEN, Col., MC, USA*

PHOTOMICROGRAPHY, by Dr. *Roy M. Allen,* 2nd edition, 441 pages; illustrated. D. Van Nostrand Company, Inc., New York, N. Y., 1958. Price $9.

The second edition of this book conveys to the reader basic principles and technical details of photomicrography with exceptional ease and clarity. The medical profession, and especially the pathologists, are producing the largest volume of published photomicrographs but in this field of medical illustration pictures of mediocre quality are seen much too often. The author collected a wide variety of photo-

micrographs in the last chapter that set a high standard of illustrating quality and pictorial composition, all with explanation and exposure data. Low and very high power enlargements present special difficulties that are dealt with in detail. The characteristics, limitations, and selection of light filters are well illustrated. Choosing a proper color filter is difficult, in spite of considerable knowledge of its technical characteristics, as stated so candidly by the author: "No one need be ashamed of his ignorance in this respect, for this is a problem likely to stump the best of us." Ample description and illustration are given of modern equipment as well as older apparatus. A chapter is devoted to special photomicrographic processes, including among others application of color photography, the use of dark field, polarized light and narrow spectral bands, all important techniques for the biologist. This manual is recommended for physicians interested in photomicrography and is a must for medical photographers.

—*J. E. SZAKACS, Lt.,MC, USN*

JUVENILE DELINQUENCY, edited by *Joseph S. Roucek*, with the collaboration of 14 eminent authorities. 370 pages. Philosophical Library,Inc., New York, N. Y., 1958. Price $10.

This work consists of 14 chapters on various aspects of juvenile delinquency, including articles on the dimensions, and legal, economic, biological, and cultural aspects of the problem. There is also an interesting chapter on the relationship between mass media and juvenile delinquency, a balanced and careful appraisal which, among other observations, concludes that there is no good evidence that avid reading of comic books is a primary factor in causing delinquent behavior. While the point of view of most of the authors appears to be that delinquency is the result of a multiplicity of interacting factors—social, cultural, economic, inter and intra personal—the emphasis is naturally on the importance of sociologic factors. The point is made more than once that perhaps the majority of delinquents are not "sick" individuals, psychologically speaking, but deviate from conventional norms of behavior because of identification with the standards of the group to which they belong; that in a sense they have a capacity for group adjustment, which is a frequent criterion for gauging "normalcy." Such persons may not be, as individuals, psychologically "abnormal." It is implied here and there that psychiatry does not recognize this sufficiently. There is one chapter entitled "A Critique of Psychiatry," written by Professor Harkeem of the University of Michigan, which decries the allegedly stultifying influence of psychiatric thought on efforts to understand and treat (Professor Harkeem would object to this last word) juvenile delinquency. There is just a smidgen of truth to some of this writer's strictures, but he vastly overstates his case in a curiously passionate, almost polemic fashion, in contrast to the balanced and even tone of the majority of other articles in this fairly interesting and informative book.

—*CHARLES S. MULLIN, Jr.,Capt., MC, USN*

DIFFICULT DIAGNOSIS. A Guide to the Interpretation of Obscure Illness, by *H. J. Roberts*, M. D. 913 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1958. Price $19.

This volume has been prepared by a practicing internist as an aid in early recognition of obscure diseases. The aim of the text is to serve in the diagnosis of these conditions at the onset of the illness rather than late in the disease when the classic syndromes have been fully developed. The differential diagnosis of several clinical manifestations which frequently are the presenting features of systemic disorders are included, and an analysis of the possible complications and therapeutic measures employed are discussed. Emphasis is placed on the familial predisposition to disease in asymptomatic relatives, and the recognition of striking genetic linkage in certain diseases is stressed. One entire section is devoted to obscure postoperative complications and medical-surgical problems relating to abdominal pain, gastro-intestinal hemorrhage, and intestinal obstruction. This volume, containing a wealth of hard-to-find information, will assist the general practitioner, surgeon, and internist in his analysis of findings manifest in disease of obscure etiology. The extensive bibliography of more than 3,000 titles and statistical information make this text a valuable reference for the clinical investigator.

—WILLIAM STEIN, Lt. Col., MC, USA

LUMBAR DISC LESIONS, Pathogenesis and Treatment of Low Back Pain and Sciatica, by *J. R. Armstrong*, M. D., M. Ch., F. R. C. S., with a foreword by *H. Osmond-Clarke*, C. B. E., F. R. C. S. 2d edition. 244 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $12.

In spite of, or perhaps because of, the voluminous literature dealing with low back pain and sciatic nerve symptoms, considerable difference of opinion still exists regarding the causative factors. This excellent book appears to crystallize the role of the intervertebral disk. It is concise and well written. The numerous illustrations, mostly diagrams, emphasize the important features in the text. One could almost adsorb the theme of the book by studying the diagrams and the accompanying captions. In addition to thoroughly covering lumbar disk lesions, there is an excellent section on the differential diagnosis of low back pain and sciatica. The author's vast experience, drawn from 1,000 documented disk operations, does not prejudice his opinion regarding the conservative treatment of patients with low back pain and he outlines a very intelligent program of conservative therapy. He is firm in his opposition to the use of myelography as a routine diagnostic tool and presents plausible arguments against its use. One can find very little to criticize in this book. The only omission that is noticeable is that chordoma is not included in the differential diagnosis of neoplastic conditions. Here is a useful contribution to medical literature to be read by anyone treating back pain.

—HERBERT A. MARKOWITZ, Capt., MC, USN

OBSTETRICAL PRACTICE, by *Alfred C. Beck,* M. D., and *Alexander H. Rosenthal,* M. D. 7th edition. 1,115 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $14.

The seventh edition of this classical text on obstetrics retains all the outstanding features of the previous editions. The chapters on the development, structure and physiology of the placenta, prolapse of the umbilical cord, and multiple pregnancy have been completely rewritten. The revised sections stress the current concepts on the management of pregnancy, labor and the puerperium, and neoplastic changes in the chorion and hydramnios. Pitocin is recommended for uterine dysfunction and replaces the use of the abdominal binder. X-ray examination is restricted to specific indications, and the Brandt-Andrews method of placental expression and manual removal replace the true and modified Credé method in the management of the third stage of labor. The book retains its original format including the liberal use of simple sketches to illustrate the discussion. These are markedly effective, particularly for the understanding of the normal and abnormal mechanisms of labor. Controversial subjects are not discussed, as the book is intended for medical students, and can accordingly be highly recommended for such students, interns and general practitioners.

—*WILLIAM C. HERNQUIST, Lt. Col., USAF (MC)*

CLINICAL RADIOLOGY OF ACUTE ABDOMINAL DISORDERS, by *Bernard S. Epstein,* M. D. 352 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1958. Price $15.

This comprehensive textbook is not a descriptive volume of the radiological findings in the "acute abdomen" but rather a clinical treatise of those abdominal complaints in which roentgenologic studies and their competent interpretation will be of benefit to surgeon, internist, and patient alike. The text has been kept to a minimum but there is an ample bibliography following each condition discussed. Radiological technic and types of examination are not included. The individual radiologist, as the author implies in his preface, should use those technics which give him the best results and which do the patient the least harm.

Of four chapters, the first includes a section on the embryologic development of the abdominal viscera, and covers all the common and many uncommon congenital disorders. This is followed by a chapter on neoplastic diseases. Chapter three deals with inflammatory disorders, parasitic and granulomatous diseases, collagen and metabolic disturbances, as well as vascular disorders. In chapter four the author discusses trauma, foreign bodies, and the effect of drugs. Most conditions discussed are well illustrated by clear, positive reproductions. This text makes a worthy contribution to radiological literature. It will be of particular value as a ready reference to the young radiologist and resident who occasionally fails to make a diagnosis because he "just doesn't think of a particular condition at that moment."

—*JOHN A. ISHERWOOD, Col., MC, USA*

New Books

Books received by the *U. S. Armed Forces Medical Journal* are acknowledged in this department. Those of greatest interest will be selected for review in a later issue.

MEDICAL DEPARTMENT, UNITED STATES ARMY, Preventive Medicine in World War II. Communicable Diseases - Transmitted Chiefly Through Respiratory and Alimentary Tracts. Volume IV. Prepared and published under the direction of Major General *S. B. Hays*, The Surgeon General, United States Army. Editor-in-Chief: Colonel *John Boyd Coates, Jr.*, MC, USA; Editor for Preventive Medicine: *Ebbe Curtis Hoff*, Ph. D., M. D., Assistant Editor: *Phebe M. Hoff*, M. A. Office of The Surgeon General, Washington, D. C., 1958. 544 pages; illustrated. U. S. Government Printing Office, Washington 25, D. C. Price $5.50.

LESIONS OF THE LOWER BOWEL, by *Raymond J. Jackman*, M. D., M. S. in Proctology. 347 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $15.50.

THE CHEMICAL PREVENTION OF CARDIAC NECROSES, by *Hans Selye*, M. D., Ph. D., D. Sc. 235 pages; illustrated. The Ronald Press Company, New York, N. Y., 1958. Price $7.50.

PROGRESS IN NEUROLOGY AND PSYCHIATRY. An Annual Review, Volume XIII, edited by *E. A. Spiegel*, M. D. 611 pages. Grune & Stratton, Inc., New York, N. Y., 1958. Price $12.

VIRAL AND RICKETTSIAL INFECTIONS OF MAN, edited by *Thomas M. Rivers*, M. D., and *Frank L. Horsfall, Jr.*, M. D. 3d edition. 967 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa., 1958. Price: $8.50.

POLIOMYELITIS. Papers and Discussions Presented at the Fourth International Poliomyelitis Conference, compiled and edited for the International Poliomyelitis Congress. 684 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa., 1958. Price: $7.50.

INVESTMENTS FOR PROFESSIONAL PEOPLE, by *Robert U. Cooper*, M. D. Revised edition. 342 pages. The Macmillan Company, New York, N. Y., 1958. Price $4.95.

LIPPINCOTT'S HANDBOOK OF DENTAL PRACTICE, edited by *Louis I. Grossman*, D. D. S. 3d edition. 534 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa., 1958. Price: $14.

X-RAY DIAGNOSIS OF THE ALIMENTARY TRACT IN INFANTS AND CHILDREN, by *Edward B. Singleton*, M. D. 352 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill. 1958. Price: $11.

EMOTIONAL PROBLEMS OF CHILDHOOD, edited by *Samuel Liebman*, M. D. 176 pages. The J. B. Lippincott Company, Philadelphia, Pa., 1958. Price: $5.

TREATMENT IN INTERNAL MEDICINE, by *Harold Thomas Hyman*, M. D. 609 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa. 1958. Price $12.50.

TREATMENT OF CANCER AND ALLIED DISEASES, edited by *George T. Pack*, M. D., F. A. C. S., and *Irving M. Ariel*, M. D., F. A. C. S. 2d edition. 316 pages; illustrated. Volume 2, TUMORS OF THE NERVOUS SYSTEM, with 30 contributors. Paul B. Hoeber Inc., Medical Book Department of Harper Bros., New York, N. Y., 1958. Price $15.

TEMPORAL LOBE EPILEPSY. A Colloquium Sponsored by the National Institute of Neurological Diseases and Blindness, National Institutes of Health, Bethesda, Maryland. In Cooperation with the International League Against Epilepsy. Edited by: *Maitland Baldwin*, M. D., and *Pearce Bailey*, Ph. D., M. D. Co-Editors: *Cosimo Ajmone-Marsan*, *Igor Klatzo*, and *Donald Tower*. 581 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $15.50.

POLYSACCHARIDES IN BIOLOGY, Transactions of the Third Conference, May 29, 30, and 31, 1957, Princeton, N. J., edited by *Georg F. Springer*, M. D. 249 pages; illustrated. Josiah Macy, Jr. Foundation, New York, N. Y., 1958. Price $4.75.

DORLAND'S POCKET MEDICAL DICTIONARY. Abridged from Dorland's Illustrated Medical Dictionary. 20th edition. 674 pages. W. B. Saunders Company, Philadelphia, Pa. 1959. Price $4.50.

HEALTH EDUCATION IN THE ELEMENTARY SCHOOL, by *Carl E. Willgoose*, Ed. D., 450 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $5.25.

THE EFFECT OF ADVANCING AGE UPON THE HUMAN SPINAL CORD, by *L. Raymond Morrison*, M. D., with the collaboration of *Stanley Cobb*, M. D., and *Walter Bauer*, M. D. 127 pages; illustrated. Harvard University Press, Cambridge, Mass., 1959. Price $6.

THE YEAR BOOK OF RADIOLOGY (1958-1959 Year Book Series). Radiologic Diagnosis edited by *John Floyd Holt*, M.D., and *Fred Jenner Hodges*, M.D. Radiation Therapy edited by *Harold W. Jacox*, M.D., and *Morton M. Kligerman*, M.D. 448 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $10.

THE YEAR BOOK OF GENERAL SURGERY (1958-1959 Year Book Series), edited by *Michael E. DeBakey*, B.S., M.D., M.S. With a section on Anesthesia, edited by *Stuart C. Cullen*, M.D. 588 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $7.50.

PRACTICAL LEADS TO PUZZLING DIAGNOSES, by *Walter C. Alvarez*, M. D., D. SC. 490 pages. J. B. Lippincott Company, Philadelphia, Pa., 1958. Price $9.

NUTRITION IN HEALTH AND DISEASE, by *Lenna F. Cooper*, B. S., M. H. E., SC. D.; *Edith M. Barber*, B. S., M. S.; *Helen S. Mitchell*, A. B., PH. D.; and *Heinderika J. Rynbergen*, B. S., M. S. 13th edition. 734 pages; illustrated. J. B. Lippincott Company, Philadelphia, Pa., 1958. Price $6.

THE SOCIAL IMPACT OF BOMB DESTRUCTION, edited by *Fred Charles Ikle*. 250 pages; illustrated. University of Oklahoma Press, Norman, Okla. 1958. Price $3.95.

LONG-TERM ILLNESS - MANAGEMENT OF THE CHRONICALLY ILL PATIENT, edited by *Michael G. Wohl*, M. D., with 79 contributors. 748 pages; illustrated. W. B. Saunders Company, Philadelphia, Pa., 1959. Price $17.

YOUNG ENDEAVOR. Contributions to Science by Medical Students of the Past Four Centuries, by *William Carleton Gibson*, D. Phil. (Oxon), M. D., C. M., with a Foreword by Sir *Henry Dale*, O. M. 292 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $6.50.

THE FAMILY IN CONTEMPORARY SOCIETY. The Eastern States Health Education Conference. The New York Academy of Medicine. Edited by *Iago Galdston*, M. D. 147 pages. International Universities Press, Inc., New York, N. Y., 1958. Price $3.

THE INTEGRATION OF BEHAVIOR, Volume III, The Reintegrative Process in a Psychoanalytic Treatment, by *Thomas M. French,* M. D. 484 pages. The University of Chicago Press, Chicago, Ill., 1958. Price $10.

THE BIRTH OF NORMAL BABIES, by *Lyon P. Strean,* Ph. D., D. D. S., F. A. P. H. A., F. A. A. A. S. Foreword by *H. E. Lehmann,* M. D. 194 pages. Twayne Publishers, Inc., New York, N. Y., 1958. Price $3.95.

ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, Volume 72, Art. 11, pages 353-386, November 18, 1958. Editor-in-chief: *Otto V. St. Whitelock.* Managing editor: *Franklin N. Furness.* Associate editor: *Grace McGraw Smith.* "Rational Simplifications for the Buckling Length of Columns," by *Thomas C. Kavanagh.* 33 pages; illustrated. The New York Academy of Sciences, New York, N. Y., 1958. Price $2.50.

ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, Volume 73, Art. 5, pages 911-1037, November 10, 1958. Editor-in-chief: *Otto V. St. Whitelock.* "Psoriasis." Managing Editor: *Franklin N. Furness.* Associate Editor: *Francis S. Stahl.* 126 pages; illustrated. The New York Academy of Sciences, New York, N. Y., 1958. Price $2.75.

ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, Volume 74, Art. 2, pages 161-406, November 12, 1958. Editor-in-chief: *Otto V. St. Whitelock.* "Photoreception." Managing Editor: *Franklin N. Furness.* Associate Editor: *Grace McGraw Smith.* 245 pages; illustrated. The New York Academy of Sciences, New York, N. Y., 1958. Price $3.50.

ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, Volume 76, Art. 3, pages 409-970, December 5, 1958. Editor-in-chief: *Otto V. St. Whitelock.* Managing Editor: *Franklin N. Furness,* Associate Editor: *Francis S. Stahl.* "Screening Procedures for Experimental Cancer Chemotherapy," by *C. Chester Stock* (Conference Chairman) et al. 561 pages; illustrated. The New York Academy of Sciences, New York, N.Y., 1958. Price $5 per copy.

PROGRESS IN CLINICAL PSYCHOLOGY. Volume III, edited by *Daniel Brower,* Ph.D., and *Lawrence E. Abt,* Ph.D. 249 pages. Grune & Stratton, Inc., New York, N.Y., 1958. Price $7.75.

CLINICAL OBSTETRICS AND GYNECOLOGY, Volume 1, No. 4, December 1958. A quarterly book series. Symposium on Operative Obstetrics, edited by *J. Robert Willson,* M.D., and Symposium on Genital Cancer, edited by *Daniel G. Morton,* M.D. 1,138 pages; illustrated. Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers, New York, N.Y., 1958. Price $18. per year—subscription of 4 issues.

RORSCHACH TEST DIAGNOSIS, A Textbook by *Ewald Bohm,* Ph.D. 322 pages. Grune & Stratton, Inc., New York, N.Y., 1958. Price $7.75.

STAPHYLOCOCCAL INFECTIONS, by *Ian Maclean Smith,* M.D., Ch.B., F.R.F.P.S.G., 180 pages. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $4.25.

THE AMPHETAMINES, Their Actions and Uses, by *Chauncey D. Leake,* Ph.D. A Monograph in The Bannerstone Division of American Lectures in Pharmacology, American Lecture Series, Publication No. 338. 167 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $4.50.

PRELIMINARY RESULTS OF SCIENTIFIC RESEARCHES ON THE FIRST SOVIET ARTIFICIAL EARTH SATELLITES AND ROCKETS – ARTICLES – XI Section of IGY Program (Rockets and Satellites). No. 1. 150 pages; illustrated. *Publishing House of the Academy of Sciences of the USSR,* Moscow, 1958.

NUTRITION AND ATHEROSCLEROSIS, by *Louis N. Katz,* M.D., *Jeremiah Stamler,* M.D.; and *Ruth Pick,* M.D. 146 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1958. Price $5.

LEUKEMIA, by *William Dameshek,* M.D., and *Frederick Gunz,* M.D., Ph.D. 420 pages; illustrated. Grune & Stratton, Inc., New York, N.Y., 1958. Price $15.75.

REVERSICON— A Medical Word Finder, by *J. E. Schmidt,* Ph.B.S., M.D., Litt.D. 440 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $7.50.

TUMORS OF THE LUNGS AND MEDIASTINUM, by *B. M. Fried,* M.D., F.C.C.P. 467 pages; illustrated. Lea & Febiger, Philadelphia, Pa., 1958. Price $13.50.

PROBLEMS OF ADDICTION AND HABITUATION, edited by *Paul H. Hoch,* M.D., and *Joseph Zubin,* Ph.D. The Proceedings of the Forty-Seventh Annual Meeting of the American Psycho-Pathological Association, held in New York City, February 1957. 250 pages. Grune & Stratton, Inc., New York, N.Y., 1958. Price $6.50.

LIPIDOSES. Diseases of the Intracellular Lipid Metabolism, by *Siegfried J. Thannhauser,* M.D., Ph.D., Hon. M.D., Universities of Freiburg, Munich, Dusseldorf. 3d edition, revised and enlarged. 600 pages; illustrated. Grune & Stratton, Inc., New York, N.Y., 1958. Price $19.75.

GROWTH AND DEVELOPMENT OF CHILDREN, by *Ernest H. Watson,* M.D., and *George H. Lowrey,* M.D. 3d edition. 334 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $7.75.

DISEASES OF THE NERVOUS SYSTEM. Described for Practitioners and Students by Sir *Francis Walshe,* M.D., D.Sc., F.R.S., with chapters on The Neurological Complications of Liver Disease and Hepatolenticular Degeneration by *J. M. Walshe,* M.R.C.P. 9th edition. 373 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $8.

MEDULLOBLASTOMA, by *Benjamin L. Crue, Jr.,* Lt. Comdr., MC, USN. A Monograph in the Bannerstone Division of American Lectures in Surgery, American Lecture Series, Publication No. 339, edited by *Michael E. DeBakey,* M.D., and *R. Glen Spurling,* M.D. A Monograph in American Lectures in Neurosurgery, edited by *Barnes Woodhall,* M.D. In two parts, First Part: Pathological Aspects; Second Part: Clinical Aspects of Incidence, Diagnosis, Treatment, Prognosis. 206 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $5.75.

PHOTOMICROGRAPHY, by Dr. *Roy M. Allen.* 2d edition. 441 pages; illustrated. D. Van Nostrand Company, Inc., New York, N.Y., 1958. Price $9.

THE AIR. Conquest of Space and Time, by *Edgar B. Schieldrop,* C. E., D. Sc. Foreword by *The Lord Brabazon of Tara,* G. B. E., M. C., P. C. 256 pages; illustrated. Philosophical Library, New York, N. Y., 1958. Price $12.

TUBERCULOSIS: PREVENTION AND CONTROL, by *H. W. Hetherington,* M. D., M. R. C. P. (London), and *Fannie W. Eshleman,* R. N., B. S. 4th edition, revised, reset, and retitled. 404 pages; illustrated. G. P. Putnam's Sons, New York, N. Y., 1958. Price $6.50.

CYCLOPROPANE ANESTHESIA, by *Benjamin Howard Robbins,* B. A., M. S., M. D. 2d edition. 292 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $9.

THE HEALTH OF A NATION—Harvey W. Wiley and the Fight for Pure Food, by *Oscar E. Anderson, Jr.* 333 pages. The University of Chicago Press, Chicago, Ill., 1958. Price $6.

SCHIZOPHRENIA, a review of the syndrome, edited by *Leopold Bellak,* M.D., with the collaboration of *Paul K. Benedict;* M.D. A Logos Publication in Behavioral Science. *Leonard Small,* Ph.D., science editor. 1,010 pages. Logos Press, New York, N.Y., 1958. Price $14.75.

DISEASES OF CHILDREN IN THE SUBTROPICS AND TROPICS, by *H. C. Trowell,* O.B.E., M.D., F.R.C.P., and *D. B. Jelliffe,* M.D., M.R.C.P., D.C.H., D.T.M. & H. 919 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $18.50.

MUIR'S TEXT-BOOK OF PATHOLOGY, revised by *D. F. Cappell,* C.B.E., M.D., F.R.F.P.S., M.R.C.P., F.R.S.Ed. 7th edition. 1,201 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $14.50.

SEVEN ROADS TO MOSCOW, by *W. G. F. Jackson,* M.C., B.A., R.E. 334 pages; illustrated. Philosophical Library, New York, N.Y., 1958. Price $7.50.

REVERSIBLE RENAL INSUFFICIENCY, Diagnosis and Treatment, by *Donald H. Atlas,* M.D., Ph.D., F.A.C.P., and *Peter Gaberman,* M.D. 231 pages. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $7.

SURFACE AND RADIOLOGICAL ANATOMY, for students and general practitioners, by *A. B. Appleton; W. J. Hamilton,* M.D., D.Sc., F.R.S.E., and *Ivan C. C. Tchaperoff.* 4th edition by *W. J. Hamilton,* M.D., D.Sc., F.R.S.E., and *G. Simon,* M.D., B.Ch., D.M.R.E. (Cantab.), F.F.R. 355 pages; illustrated. The Williams & Wilkins Company, Baltimore, Md., 1958. Price $9.50.

A LABORATORY MANUAL ON "ABNORMAL HAEMOGLOBINS," prepared under the direction of *J. H. P. Jonxis* and *T. H. J. Huisman* for *The Council for International Organizations of Medical Sciences and the Middle East Science Co-operation Office of UNESCO.* 39 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $2.

PERSONALITY CHANGE AND DEVELOPMENT, As Measured by the Projective Techniques, by *Molly Harrower,* Ph.D. 383 pages; illustrated. Grune & Stratton, Inc., New York, N.Y., 1958. Price $10.

CLINICAL HAEMATOLOGY IN MEDICAL PRACTICE, by *G. C. de Gruchy,* M.D. (Melb.), F.R.A.C.P., M.R.C.P., (Lond.), M.C.P.A., with a foreword by *J. V. Dacie.* 620 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $10.

THE ABO BLOOD GROUPS. Comprehensive Tables and Maps of World Distribution, by *A. E. Mourant,* M.A., D.Phil., D.M. (Oxford), M.R.C.P. (London), et al. 276 pages. Charles C Thomas, Publisher, Springfield, Ill., 1958. Price $8.50.

MANAGEMENT OF THE NEWBORN, by *Arthur Hawley Parmelee,* M.D. 2d edition. 368 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., 1958. Price $8.50.

The following titles were listed incorrectly in the November 1958 Journal:

OPHTHALMIC LITERATURE for 1957, Volume XI, Number 5, September 1958, edited by Sir *Stewart Duke-Elder,* G. C. V. O. Contents: 562 Abstracts from current ophthalmic literature. Published by The British Medical Association, Tavistock Square, London, W. C. 1. Issued quarterly. Price: Annual subscription, four guineas, post free. $13.

OPHTHALMIC LITERATURE for 1958, Volume XII, Number 1, September 1958, edited by Sir *Stewart Duke-Elder,* G. C. V. O. Contents: 575 Abstracts from current ophthalmic literature. Published by The British Medical Association, Tavistock Square, London, W. C. 1. Issued quarterly. Price: Annual subscription, four guineas, post free. $13.

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